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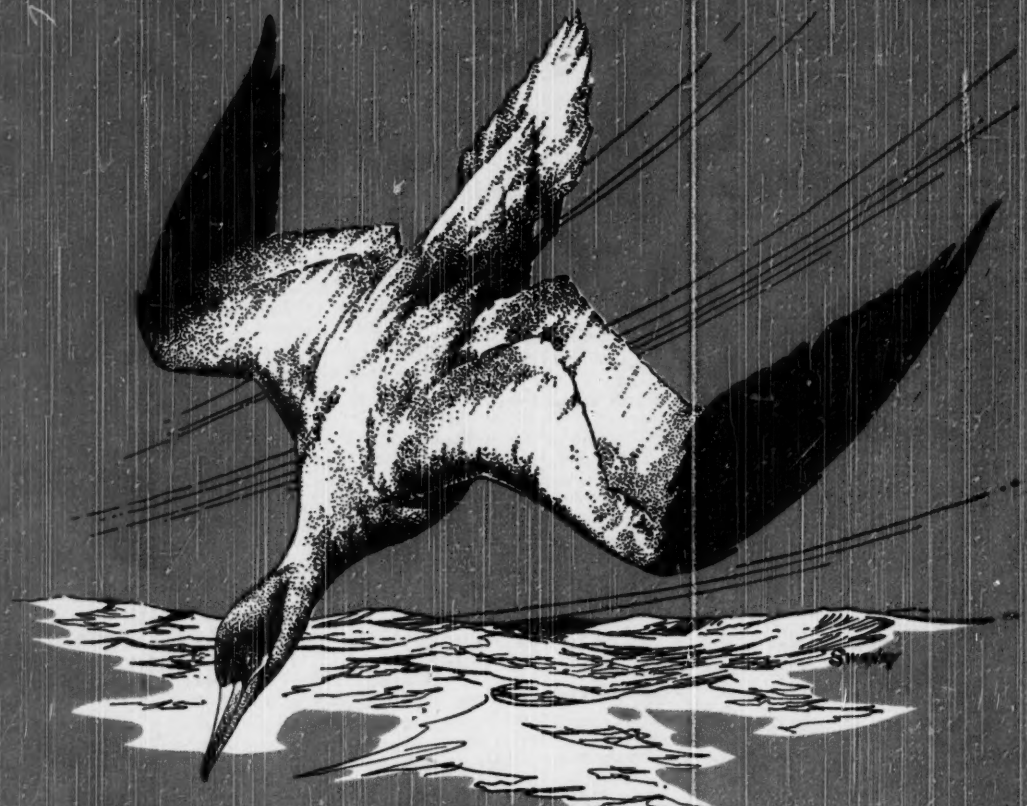

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CVA AND CONSERVATION

The Editor, *Nature Magazine:*

Having been a member of the American Nature Association for a quarter of a century, perhaps it is my privilege to comment on the editorial "What About CVA?" appearing in the current (January, 1950) issue of *Nature Magazine.* This editorial, as I read it, places a general stamp of approval upon the proposed CVA legislation, as the "essential basic approach" to coordinated resource management in the Columbia River Valley. It repeats the familiar charge that some of the opposing groups are merely fronts for the power interests; it implies that all programs of the three Directors would be responsive to local views because "the administrators of any such agency as CVA would be continually on trial before Congress"; it expresses opposition to "super governments and dictatorial tendencies" but seems to decide that these should be risked in the interest of natural resource management. The closing sentence carries not only a challenge, but an accusation that seems unjustified: "If the opponents of the specific proposals now before Congress would exert as much energy in constructive suggestion as they now do in blind and often uninformed opposition, there would be happier prospect of a solution vital to all of us."

I shall comment briefly on these statements, consider the main conservation issue involved, and finally answer the challenge and accusation of the final sentence of the editorial. But first I think it will be agreed that endorsement of the pending CVA legislation automatically carries endorsement of the full plan for dividing the entire nation into a group of watershed regions administered by huge government corporations to be known as "Authorities" or Administrations."

Now it is true, and it is perfectly logical, that "power interests" are opposed to this national plan as patterned by the CVA bill before Congress (S. 1645). For the system planned would not merely regulate power companies to prevent monopoly in private enterprise; eventually it would eliminate them entirely, creating in their place one gigantic government power monopoly little subject to regulation by the people. It is also true that *some* of the opposition to CVA bears — in the words of the editorial — the "invisible fingerprints of equally opposed power interests"; but it is likewise true that much of the support for CVA arises thusly: "If the damned power interests are *ag'in'* it, I'm all *for* it." Neither side has a corner on "blind and often uninformed" opinion.

"What About CVA?" carries the belief, doubtless sincere, that the provision for local advisory groups and the need for the administrators to stand "continually on trial before Congress" would insure responsiveness to local views and interests. If this theory works in practice, why is the National Grange — one of the two leading general farm organizations of the nation — asking that provision be made for court settlement of disputes between the U. S. Forest Service and citizens having a voice through present local advisory groups? The CVA bill provides that the Directors shall establish such advisory boards and councils as *they* may decide to be "necessary or appropriate" to achieve the objectives of the act — as *they* interpret these objectives. Such a provision is hardly reassuring to those of us who feel that conservation programs must have maximum flexibility to deal with local conditions. Neither is the editorial's "continually on trial before Congress" statement reassuring when the CVA bill gives the Directors power "to determine the necessity for and the character and amount of its expenditures and the manner in which they shall be incurred, allowed, and paid"; provides for "lump-sum" appropriations, from which the Directors may allocate construction costs (of dams, reservoirs, buildings, industrial plants, hydroelectric plants and transmission lines) without approval by Congress; and provides that the Directors may use receipts of power and other projects to pay for costs incurred in projects constructed according to their own allocation.

Let us examine two general statements in the editorial "What About CVA?". In support of arguments for a coordinated conservation program: ". .the top soil of other rich lands washes down the river for lack of an integrated soil conservation program and funds to carry this through. Denuded watersheds erode for lack of funds to reforest, as a part of an over-all plan. Fish and wildlife suffer as a by-product of both of these situations." In other words, the present Soil Conservation Service, U. S. Forest Service, and Fish and Wildlife Service are failing to do their conservation job for lack of funds granted by the people through Congress — in our democratic manner. Contrast this with an earlier statement that under the CVA the functions of these present Services "would not be taken over by CVA but coordinated into its over-all conservation and development plan for the area. Such a plan the CVA would be charged with preparing, basing it upon consultation with all Federal, State, local and private agencies in the region." The reasoning behind these statements postulates one or the other of two theories: 1. That upon creation of a CVA, the taxpayers will gladly shell out the extra dollars for which the Forest Service has repeatedly been asking for replanting of denuded lands, and the money which they have been refusing the Soil Conservation Service for the reduction of soil losses; or, 2. Under the CVA, funds can be used for conservation — according to the ideas of the Directors — without consent of the people. The first theory appears merely to be wishful thinking; the second raises

(Continued on page 118)

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Nature in Print

By HOWARD ZAHNISER

I REMEMBER one week-end day in Albuquerque last June reading Reginald L. Cook's *Passage to Walden* in the luxury of an air-conditioned, motel cabin, complete with shower, refrigerator — and kitchen stove, too, as I recall. Until evening came and good friends called to take me to a dinner of Mexican food at La Placita, I ventured only once from my motor-court cabin, and that for a breakfast. For the rest of that warm New Mexico day I had the coolness of the cabin and the refreshment of Mr. Cook's *Passage to Walden*. Almost I was content with my homesick loneliness, so far from home, so far from my native landscape, yet so engrossed with my book, so much pleased with how well it fitted my occasion. Mr. Cook's revelations of Thoreau are as clear as the bright atmosphere of Albuquerque. Even the blue cover of the book seemed just the cool clear color for that cabin. During that unoccupied day of a "business" trip, when my own home was too far away and when unnecessary pleasures, alone, would only make nostalgia the tighter, where better could I have gone than to Walden, and how could I have booked a better passage?

"*Passage to Walden*," its author states clearly at the outset, "attempts neither to tell the story of Henry Thoreau's life, nor to evaluate his relationship to 'the golden day' and the era of atomic energy."

"Its chief aim," we are told, is rather "to penetrate the essential quality and evoke the richness of his correspondence with nature."

With what better aim could an author invite me to share his book on Thoreau?

I have appreciated Mr. Cook's achievement of his aim most highly, not only during that first reading but also on later perusals, and now as I have reread again the fifty-three passages I have checked and have contemplated the whole. This is an interpretation and evaluation of Thoreau that is in accord with my own understanding, and it seems to me to be our best available introduction to the works of Thoreau — especially to the *Journal*, which is not readily accessible to all readers, but from which Mr. Cook quotes frequently.

One of my greatest enjoyments has been in reading Mr. Cook's discussion of Thoreau as one of "the literary nature writers" — a chapter entitled "Nature's Eye-Witnesses," in which so many of my best authors are limned. Each account is illuminating, each recommends Mr. Cook to me anew, and at the end of the chapter there is a distinct literary pleasure in observing his attempts at definition — although I do note a question mark on some.

"Of the literary nature-lovers discussed," says Mr. Cook in summary, "Gilbert White, John Burroughs, Jean-Henri Fabre, John Muir, and W. H. Hudson were the most scientifically inclined; Jefferies and Thoreau the most poetically inclined. In reaction to nature each has a memorable quality: Walton is buoyant; White sensible; Thoreau intense; Jefferies rapturous; Muir fervid; Burroughs equable; Fabre clairvoyant; Hudson expectant. The effect of their work upon the reader is another matter. Walton is beguiling; White instructive; Thoreau provocative; Jefferies reanimating; Muir infectious; Burroughs informative; Fabre fascinating; Hudson exhilarating."

I wonder how Mr. Cook would characterize Aldo Leopold, whose posthumous book, *A Sand County Almanac*, also is before me. I wonder if he might not say that Leopold's reaction to Nature was practical, he who opens his book with the pronouncement: "There are some who can live without wild things, and some who cannot. These essays are the delights and dilemmas of one who cannot." Leopold pleads "for the preservation of some tag-ends of wilderness, as museum pieces, for the edification of those who may one day wish to see, feel, or study the origins of their cultural inheritance." He defines wilderness as "the raw material out of which man has hammered the artifact called civilization." And he observes that, with our pioneer conquest established, "to the laborer in repose, able for the moment to cast a philosophical eye on his world, that same raw stuff is something to be loved and cherished, because it gives definition and meaning to his life." These surely are practical considerations, as were so many of Leopold's distinctive concerns in pioneering in our modern technology of wildlife management.

All in all, the effect of his work on the reader might be described as enlightening and corrective. He is the good teacher — Professor Leopold, as he was known to so many.

"We all strive for safety, prosperity, comfort, long life, and dullness," he writes in a characteristic manner. "The deer strives with his supple legs, the cowman with trap and poison, the statesman with pen, the most of us with machines, votes, and dollars, but it all comes to the same thing: peace in our time. A measure of success in this is all well enough, and perhaps is a requisite to objective thinking, but too much safety seems to yield only danger in the long run. Perhaps this is behind Thoreau's dictum: In wildness is the salvation of the world. Perhaps this is the hidden meaning in the howl of the wolf, long known among mountains but seldom perceived among men."

Whether Thoreau exerted great influence on Leopold, I do not know. Leopold refers in *A Sand County Almanac* to Thoreau only this once, and he may have remembered this "dictum" from the stationery of The Wilderness Society, where it appeared at the bottom of the sheet during Leopold's service as vice-president of the Society. Thoreau, in fact, instead of "salvation" wrote "In Wildness is the preservation of the World," capitalizing both W's and he was so quoted on the stationery. Perhaps Leopold sensed subconsciously that the world, which in Thoreau's time could be *preserved* by wildness, had in a century gone so far as to need wildness for *salvation*. In any case, so far as I know, there is little evidence of a Thoreauvian influence on Leopold, who appears to have reached the area the two have in common along the "practical" route of a forester, sportsman, and wildlife management technologist, rather than along literary paths.

Nevertheless, on reflection, it seems rather appropriate that it was about Thoreau I was reading that day in Albuquerque. It was Thoreau who made the first plea I know of in our literature for the preservation of wilderness as such (in the essay "Chesuncook" in *The Maine Woods*). It was Leopold who pioneered the establishment of areas within the nation's forests for preservation as wilderness. In Albuquerque I had just come from a pack trip in the Gila Wilderness Area in southern New Mexico, the first such area so set aside — designated a quarter of a century ago at Leopold's instigation. I was pausing in Albuquerque only a day before going, according to schedule, into the Pecos Wilderness Area in northern New Mexico, where a Leopold memory was likewise about me. And there I was reading Reginald Cook saying of Thoreau:

"The West was synonymous with the wild. Wilderness represented the preservation of the world. 'From the forest and wilderness came the tonics and barks which brace mankind,' he asserted. . . . He would have approved of the wilderness areas now open to a highly urbanized people, areas like the Porcupine hardwood forest on the Michigan peninsula, or Hell's Canyon on the Oregon-Idaho boundary between the Devils Range and the Wallowa Mountain, or Okefenokee Swamp in Georgia, or the High Sierra out of Carson City, Nevada, or the Grand Tetons out of Jackson, Wyoming, or the Bitterroot wilderness area out of Butte, Montana." And Mr. Cook might have added the Gila and Pecos wilderness areas in New Mexico, where this land-use classification of our national forest lands was introduced by Aldo Leopold.

It seems appropriate now to be thinking of these two books together. Indeed, a fortnight ago, as I reread and studied the two during the same chest cold, it seemed that they should be discussed together here most significantly. Particularly I hoped that Leopold's book, which already has been described in these pages (for January), would not be missed by so many of us, as Thoreau's works were by so many of his contemporaries. It would be unfortunate if our own generation should miss the appreciation — and enjoyment — of *A Sand County Almanac* that is in store for so many readers in the future. I hoped also to bring more readers to Reginald Cook, and thus help to accelerate the increase in the numbers of those who are appreciating Thoreau. It was my intention then to discuss certain outstanding features of Mr. Cook's chapters on "An Indian Memory," on "The Machine Age and Man," on "Nature Mysticism," and on "Correspondence with Nature" and compare these with certain parts of *A Sand County Almanac*. I am sorry I have thus come to the end of these paragraphs without realizing my intentions more fully. I hope that my readers have a better fortune, and I commend to them for comparison these two outstandingly excellent books.

Passage to Walden. By Reginald L. Cook. Boston: Houghton Mifflin Co. 1949. 238 pp. (5½ by 8½ in.) $3. (I wish there were an index.—H.Z.)

A Sand County Almanac and Sketches Here and There. By Aldo Leopold. New York: Oxford University Press. 1949. 226 pp. (5¾ by 8½ in.) with 33 illustrations (7 full-page) from drawings by Charles W. Schartz. $3.50.

Man and Universe

Man and This Mysterious Universe. By Brynjolf Bjorset. New York. 1949. Philosophical Library. 174 pages. $3.75.

The author of this stimulating book is, by training, an engineer. He has traveled widely, equipped for his peregrinations with a wondering mind. All along the way he has wondered; wondered where man fits in this mysterious universe — and how. This is the result of what he found, presented in popular terms, but provocatively. No reader could fail to be stimulated mentally by this book, however he might differ from the author's conclusions.

South Pacific

Naturalist's South Pacific Expedition: Fiji. By Otto Degener. Honolulu. 1949. Paradise of the Pacific, Ltd. 303 pages. Illustrated. $5.00.

Otto Degener spent eight months in the South Seas as a member of the second expedition of Mrs. Anne Archbold on the *Cheng Ho*, seagoing junk. Later Mrs. Archbold made it possible for the author to acquire this vessel for further exploration. Former botanist at the University of Hawaii, and naturalist at Hawaii National Park, Mr. Degener had a naturalist's catholic interest in everything he found and saw, including the people, principally in Fiji. This book is the story of a trip such as many of us would like to take. A substantial population has found pleasure in the Melanesian experiences of Mary Martin and Ezio Pinza. Mr. Degener's explorations take in somewhat more territory, and should be fascinating to all who have had their appetites whetted by the tuneful manifestation of the South Pacific on Broadway.

Wed to a Dinosaur

I Married a Dinosaur. By Lilian Brown. New York. 1950. Dodd, Mead and Company. 268 pages. $3.00.

Spending her honeymoon helping to hunt for *Baluchitherium*, Lilian Brown found out very quickly that she had, indeed, "married a dinosaur" when, in India, she became the bride of Barnum Brown, famed fossil collector of the American Museum of Natural History. "Pixie" was the name the groom called his bride, and it is plain that it was a happy choice, for her humor shines through the pages of this entertaining story of a fossil hunter's wife. As Roy Chapman Andrews says in an introduction, no man could have written this book, and he is, indeed, correct. But any man — or any woman — will revel in it. India, Burma and back home in New York provide the three general locales of this story. What happened in all three places is "Pixie" Brown's story, and all that we can say is — do not miss it.

Michigan Shrubs

Shrubs of Michigan. By Cecil Billington. Bloomfield Hills, Michigan. 1949. Cranbrook Institute of Science. 339 pages. Illustrated. $4.50.

This is a revised and enlarged edition of this excellent identification guide first published in 1943. It has taken advantage of the constructive suggestions following upon the publication of the original edition. Additional information has been included, as well as some species that originally were not regarded precisely as shrubs, bringing to 207 the number of species discussed.

Lizards and Snakes

Field Guide to the Lizards and Snakes of Wisconsin. By W. E. Dickinson. Milwaukee. 1949. Milwaukee Public Museum. 70 pages. Illustrated. 75 cents.

This is the second in the popular handbook series of the Milwaukee Public Museum. Its purpose is to bring together scattered records and reports of Wisconsin species and to provide material that will aid in identification. The last published work on the State as a whole, in this field, has been out of print for some time, and information on ranges has changed since its publication. This guide should fill a definite need.

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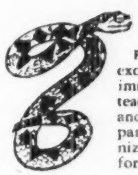

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Wild Flower Preservation Society

DR. WILLIAM M. MANN
Director, National Zoological Park

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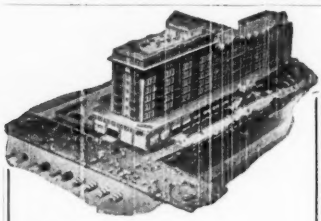

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Help for Elms

Hope for a means to check the ravages of the Dutch elm disease is seen in the development of a compound now known as Carolate. It has been developed by cooperative research between the Rhode Island Agricultural Experiment Station at Kingston, R.I., and the Bartlett Tree Research Laboratories of Stamford, Connecticut. The medicant is applied directly to the soil around trees, and preliminary experiments indicate that it antidotes the toxins produced in the vascular system, or "sap stream," by the Dutch elm fungus. It also alkalizes the soil and stimulates tree vigor, which, in turn, enables greater root absorption. Thus far the compound has been released only for experimental purposes and in limited quantity. It appears to be a preventive rather than a cure, and elms showing as much as five percent wilt or more do not appear to benefit.

Appeal for Help

From Fr. George M., Director, Marian Association Catholic Mission, Torit, Equatoria Province, A. E. Sudan, comes an appeal for magazines, newspapers, bulletins, pamphlets and booklets for use in work with the natives. English is the basic language, and material will be useful in primary and secondary schools, technical courses and teacher training centers.

Reptile Key

Lizards, Snakes and Turtles of the West. By Jay M. Savage. Los Altos, Cal. 1949. Naturegraph Company. 32 pages. Illustrated. Fifty cents.

This is an illustrated, pocket key to the reptile life of the area lying west of the Rocky Mountains and is an expansion of an earlier key to the reptiles of California. The key is simple and easy to use. Range maps are provided, and the drawings by Robert R. Harry and Patricia E. Barton are clear and practical. A great deal is packed into small space in this valuable little guide.

On the Ice

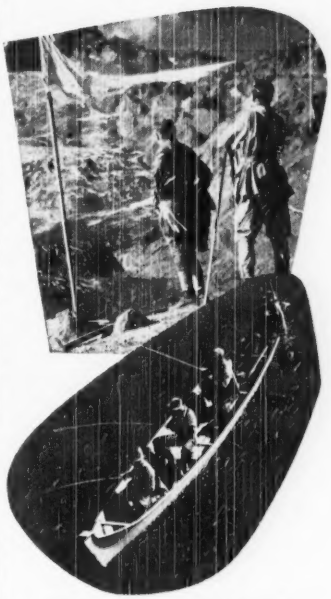
Kalak of the Ice. By Jim Kjelgaard. New York. 1949. Holiday House. 201 pages. Illustrated by Bob Kuhn. $2.50.

This is a fiction story of a great polar bear and her cubs, and of the Eskimos she eludes in the hazardous task of raising her young to maturity. It is a sympathetic, human story of north of the Arctic Circle.

Biometrical Genetics

Biometrical Genetics. By K. Mather. New York. 1949. Dover Publications. 158 pages. $3.50.

Written by a leading geneticist, this book is a study of continuous variation. It is a highly technical work covering a field of genetics not hitherto widely explored in published books.



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THE MILWAUKEE ROAD

(Continued from page 113)

the fundamental issue involved in CVA and related schemes — an issue more important and far-reaching than valley authority legislation itself: Can conservation best be accomplished by government planners or by the people?

Perhaps because a necessary foundation in resource conservation in America was laid by Theodore Roosevelt and Gifford Pinchot through providing government ownership and administration of vast land, forest, and mineral areas, we conservationists through the years have overemphasized the role of public ownership or control of natural resources. Even today, with "conservation" becoming such a popular religion that it is used to camouflage numerous political power and vote-getting schemes, it is essential that public ownership be employed to save resources which we wish to preserve in their natural state for the benefit of all people, such as our National Park areas; to set aside for national defense needs certain mineral resources; and to insure adequate administration of areas having multiple-use values, such as our Western mountain and plateau watershed areas. But it is high time we realize that programs of conservation-for-use can never be adequately successful if applied primarily as government programs devised by the planners and dictated to our citizens — even if Congress approves. The wise function of government is to provide tools with which its citizens, independently or cooperatively, can accomplish the field work of conservation. If enlightened through conservation education to the necessity of — and opportunity for — proper soil, water, forest, and wildlife conservation, rather than compelled to action by legislation or forced to support government programs through taxation, the citizens of America can and will do the job with vision, vigor, and generous use of elbow-grease.

If anyone doubts this statement, let him consider carefully the amazing development and accomplishment in soil and water conservation under the democratic Soil Conservation Districts system. Under this successful program, local farmers elected by their neighbors study the needs of their area, devise and finance their own conservation activities, and carry them out with the use of technical "tools" provided by the Soil Conservation Service and other public agencies. The local citizens themselves plan and administer the programs, while government experts act as advisors — just the reverse of the CVA setup. And the system *works* — it results in conservation achievement. It is working so well that in a dozen years it has been extended to cover three-fourths of the nation's farms — by voluntary vote of the land-owners themselves. It has given the rural people of America a chance personally to use their own brains and brawn in saving the land they love. It is providing the means for expanding programs of forest and wildlife conservation on private lands. It refutes completely the familiar argument that government must step in with sweeping conservation programs because private citizens won't do the job.

Some conservation programs, of course, are too large for such local action. Some are geographically too extensive for separate states to deal with. I heartily join the writer of "What About CVA?" in the statement "We are convinced that coordinated handling of all the natural resources of such a geographical and biological unit offers the only answer" to adequate watershed resource management. I am forced to disagree, however, with the assertion made regarding the needed broad plan: "Whether it is CVA or some other combination of initials is not too important." It is vitally important. To eliminate the weaknesses of present separate local, state, and federal agencies by adopting the CVA plan would be like eliminating spot fires by fanning the whole forest into one flame. Administration of the CVA and other valley authorities could easily destroy the successful democratic Soil Conservation Districts programs; it could put an end to the gradually improving conservation programs of the Forest Service, Bureau of Land Management, Fish and Wildlife Service, and the Soil Conservation Service; of state and local game, forestry, and water conservation agencies; and the cooperative programs of citizen organizations. It would divide Glacier National Park between two authorities, Columbia Valley and Missouri Valley — with these two perhaps squabbling for jurisdiction of that large section of the park lying in the Saskatchewan River watershed.

The valley authority plan is like so many bright dreams of public welfare planners; if it could be administered by angels, it would establish a measure of Heavenly peace and well-being upon earth. But with human nature being what it is, adoption of such a plan would repeat the basic mistakes of most vanished civilizations and crumbled nations of history: the concentration of too much power and authority in too few hands, and denial to the individual citizen of opportunity personally to contribute to the welfare of his country according to his own beliefs.

In closing, lest the labels "tool of the power interests" and "uninformed groups" be applied, let me say that I am supporting the vigorous stand against CVA and similar valley authorities taken by members of the Montana State Grange and the Montana State Farm Bureau after long and careful consideration of the issues involved; and that I am writing as a long-time member and supporter of a dozen of the nation's leading conservation organizations. I have written at some length because I appreciate the influence of *Nature Magazine*, and feel that the views herein expressed should come to your attention. In further reply to the closing sentence of the editorial, may I refer you to the plan of watershed administration being proposed by the National Grange, featuring coordination of activities of present state and federal agencies, study of economic feasibility of projects proposed, emphasis on agricultural values, and regional policy-making boards of which the majority membership would represent the watershed area. Your near neighbor in Washington, Dr. J. T. Sanders at National Grange Headquarters, 744 Jackson Place NW, would be glad to explain the plan further.

Winton Weydemeyer,
Master Montana State Grange

Nature on Microfilm

The Association has entered into an agreement with University Microfilms, Ann Arbor, Michigan to make issues of *Nature Magazine* available to libraries in microfilm form.

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Sales are restricted to those subscribing to the paper edition, and the film copy is only distributed at the end of the volume year.

The microfilm is in the form of positive microfilm, and is furnished on metal reels, suitably labeled. Inquiries concerning purchase should be directed to University Microfilms, 313 N. First Street, Ann Arbor, Michigan.

Sandhill Cranes

The Sandhill Cranes. By Lawrence H. Walkinshaw. Bloomfield Hills, Michigan. 1949. Cranbrook Institute of Science. Illustrated in black and white, with color frontispiece. $3.50

This thorough work on the sandhill cranes is based upon fifteen years of investigation of the four subspecies of these birds in Alaska, Canada, the United States, Cuba and the Isle of Pines. In that period the author traveled some seventy thousand miles. In that time he had under observation many nests of the cranes in a variety of geographical areas, studied the birds during migration and when wintering. The result is an important contribution to ornithological literature.

Contents Noted

CONVENIENTLY the Bureau of the Budget provided a most graphic graph showing the manner in which the revenues from taxable sources in our economic structure would be siphoned into Federal expenditures in the Budget for the 1950 fiscal year. We see that national defense, veterans' programs, and priming the pump of Europe's economy will take 57.3 percent of the total expenditures. Interest on the national debt adds another 13 percent. All of this is due to war, past and future. The graph also shows that 5.2 percent would be devoted to "natural resources other than primarily agricultural." This is a frightening picture. War and the threat of war — evidence of man's inability to get along with himself — constitute a staggering burden. Those resources that make us a prosperous, contented and peaceful nation — and, indeed, enable us to prime the foreign pump — come in for a relative pittance. Why, in the name of whatever phenomenon of Nature begot this earth, is Man so proud of himself as the occupant thereof?

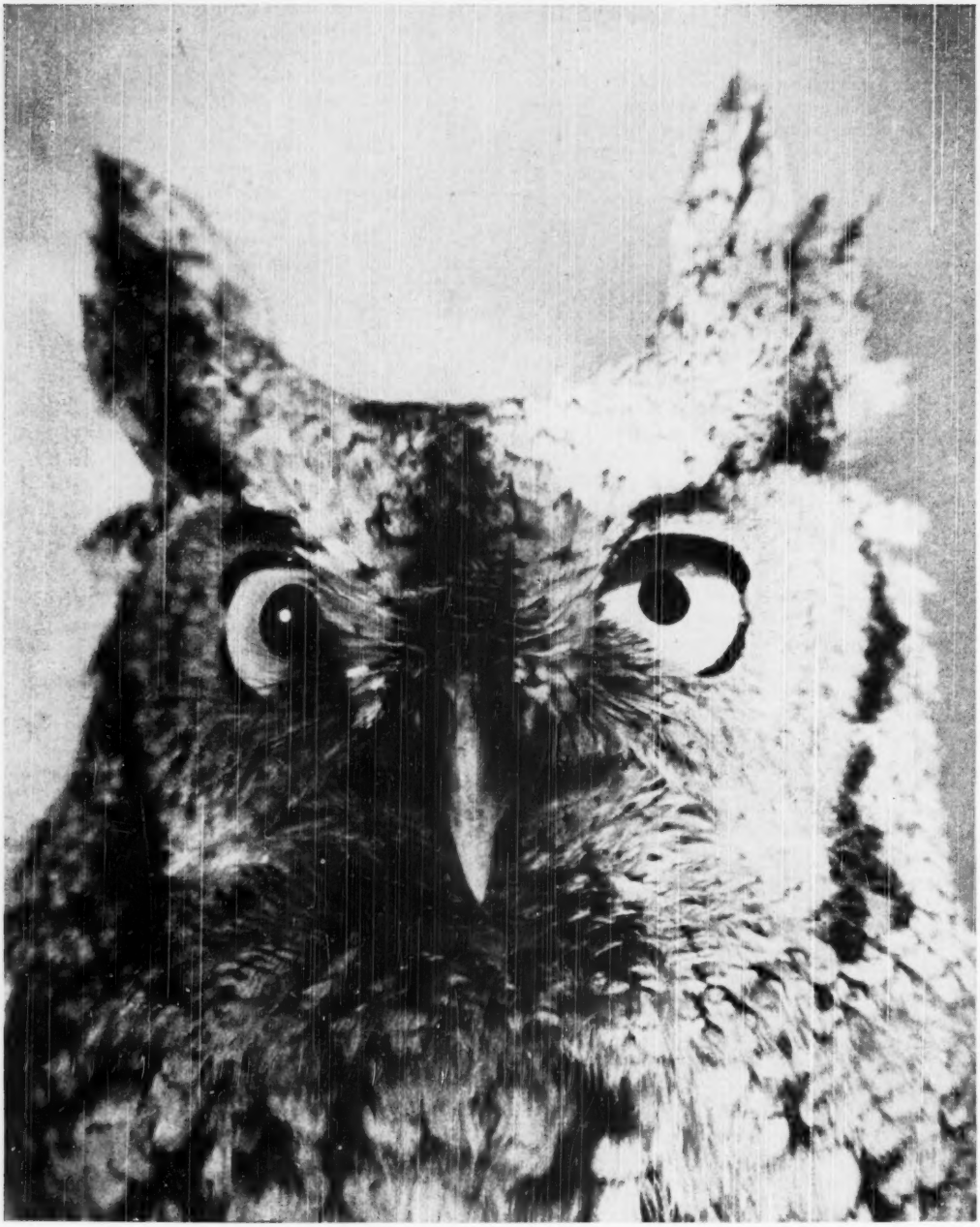
MAN, as a matter of fact, can be getting much too large for his trousers. Now he is toying with the idea of using atomic power to do a face-lifting job on the polar ice caps and turn these regions into fertile lands for his occupation. He is visualizing the use of atomic power to knock the tops off mountains and thus realize the Biblical prophecy that he can move mountains. Thus man would set himself up as the authority over the ecology of Nature; would seek to control the movement of the winds and the rains. We may be in a pessimistic mood, but it begins to appear that, if man can hit upon a way to do so, he will happily and ignorantly commit both economic and ecological suicide in rapid succession.

OUR recent request for reader reaction as to the wisdom of advertising the sale of traps designed to catch English sparrows failed to disclose any very strong feeling, quantitatively. We were forced to the conclusion that few readers of *Nature Magazine* have any desire to trap these birds, and accept them along with other visitors to their feeding stations. (In fact, this past winter we have been very much on the side of the sparrows, and disgusted with a mockingbird we call "Joe Stalin," who roosts in the holly tree and spends most of his time chasing sparrows away from the food — and all the other birds, too, except the jays) In our pages Joseph Dodson advertises a sparrow trap, along with bird houses and such. We think that he is wasting his space in so doing, so far as our readers are concerned. Further, we believe that he is doing a disservice to bird life in promoting the trap in his advertising in publications that do not go to as discriminating an audience — birdwise — as ours. We should like to see the sale of any bird traps limited exclusively to those who are licensed to band birds. One reader suggests making the nesting box into a sparrow trap, but goes on to suggest that more important is the control of the straying and night-prowling cat, which accounts for so many young birds in season. Aside from the fact that the English sparrow is not nearly as much a nuisance as a lot of people like to think it is, the chief danger of the sparrow trap in ignorant hands is the trapping of birds that can be mistaken for the house sparrow. We hope no readers of *Nature Magazine* will bother with such a trap, and will try to educate any friends who do use one as to just which bird is which.

WHEN we were in New York for the A.A.A.S. meetings we went through the experience of feeling guilty when taking our morning shower, and popped in and out quickly. We found New Yorkers acutely conscious of the water shortage, but somewhat confused as to its causes. Some conservationists have seized upon this situation to suggest that it is caused by the same conditions that create water problems elsewhere — waste of water by denuded watersheds, bad soil practices, reservoir siltation and such. Actually the New York State watersheds are well forested and carefully protected, sedimentation of the reservoirs is at a minimum, and wastage of water, at the source, relatively low. New York City's problem is population growth beyond reservoir capacity and recent dry weather. To be sure, the Hudson *could* supply water if needed were it not a hopelessly polluted stream. Nevertheless, the declaration of bathless and shaveless days directs attention to the vital importance of water — so often taken for granted and so prodigally wasted by the individual.

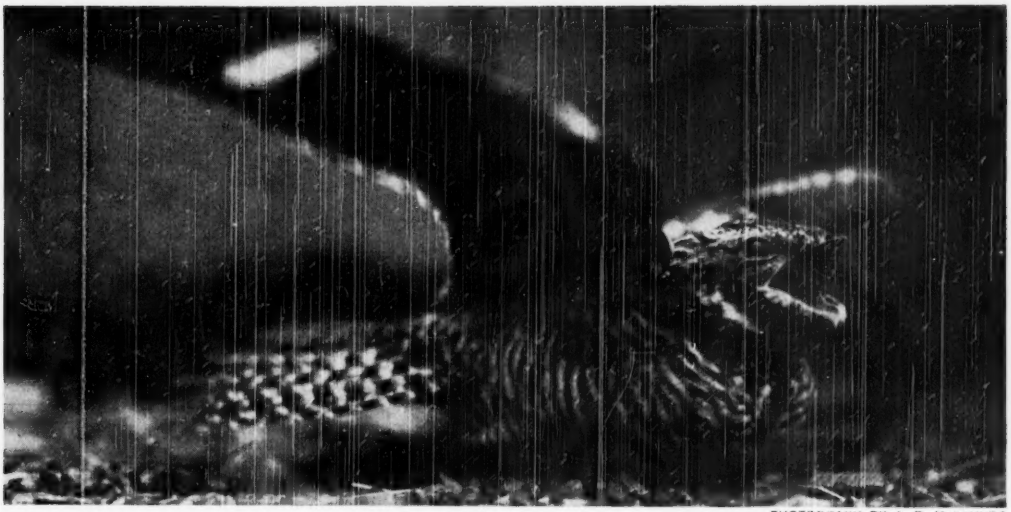
"WE WOULD like to take our wives, our children, our cattle, our pets and our antelopes and go underground for three days." Thus *The Colorado Springs Gazette-Telegraph* quotes an El Paso County cattleman, speaking for most of the ranch owners in the county. A three-day open season on antelope was about to start. He added: "We are scared to death. . .The hunters won't stop with the antelope. They'll shoot at my prize beef, my cow dog and my kids. Anything that moves. They'll shoot regardless of my wishes that they stay off my property. If necessary they'll shoot from the public highway. Against the law? Certainly. But they'll shoot and be damned." Many ranchers have declared their property to be sanctuaries for the antelope, this cattleman pointed out, but that makes no difference. He adds: "We want the antelopes to thrive. We are not going to gun for them and why should we permit anyone else to enter our property?" Such reports as this seem to be on the increase. More and more irresponsible gunners are stirring up animosity on the part of property-owners who like to have wildlife on their lands, just because they like the animals there. Property rights are coming into sharp conflict with greedy gunning pressure. Which will win?

R.W.W.



PHOTOGRAPH BY THE AUTHORS

The eye of an owl is a night eye, fine for recognizing objects from the size of a katydid to the dimensions of a mouse or young rabbit, but worthless for detailed vision. It is a large eye — so large that it cannot be turned in its socket and the bird must rotate its head to see in different directions. But being a large eye, and one provided with a rod retina, it can see in the illumination of the night sky when robins are completely blind. Note that the two pupils are of different size. They respond to changing brightness, but also express the emotions of the bird. As in most animals, they are independent in action.



PHOTOGRAPH BY A. B. MEGENVEY

The eyes of the nighthawk are designed to operate at night, for during the day these birds lie quietly, depending on their protective coloration. When night comes they patrol the air, their large mouths wide open to gather in a nocturnal meal of night-flying insects.

The Eyes of Birds

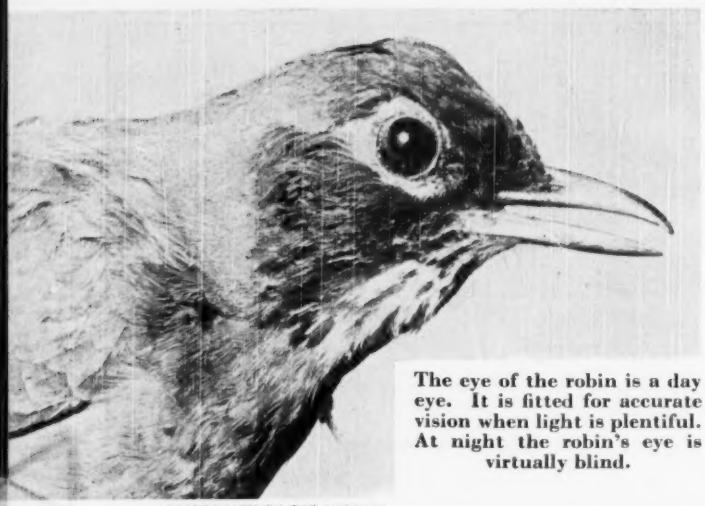
By LORUS J. and MARGERY J. MILNE

WHENEVER we walk through the fields or woods, many unseen but seeing eyes keep close watch on our every movement. Birds and squirrels in the trees, low-nesting juncos and rabbits on the forest floor, remain motionless and unobserved as long as their vision includes our ominous presence. Great numbers of these eyes are smaller duplicates of our own, with much the same design. Each of these has a spherical form, with a delicately adjusted lens system like a camera. An iris diaphragm controls the amount of illumination entering the eye, and a thin film of light-sensitive cells responds when an image is focused on it. These are the basic ingredients of an eye, whether in a bird, mammal, or reptile. But each type of living thing has some special modification of the simple plan; some adaptation that makes its particular eyes the best possible for its mode of life.

Creatures that dare to be active and seen by day, benefit from the sun and do their sleeping at night. Their eyes are arranged to operate under conditions of adequate light. To do so to best advantage, these animals have dispensed with sensitivity and are almost completely blind when the sun sets and darkness assumes command. Most birds cannot fly safely among branches until daylight again allows good vision. But these animals are keen-eyed by day. To locate a careless worm accurately enough to seize it, or to spy protectively hued insects, requires an eye with particularly clear sight.

Nighthawks and whip-poor-wills, on the other hand, lie motionless all day, relying on their protective coloration to escape notice during sunlit hours. Their eyes, although larger than those of many day-active birds, allow no clear picture of the familiar scene in the full light of day. Anything that stands still or sways gently with the breeze is lost to view. Such eyes are built to operate at night; to serve their owners in the dim illumination of the twilight sky. Then these birds patrol for flights of moths and beetles. Accuracy of vision has been, with them, sacrificed in favor of the extra sensitivity required in nocturnal shadows. Even a few visual clues mean more to a night-active bird than does clarity of vision. Sound and air-currents are far more vague than even the poorest sight, and touch would give a flying creature far too late a warning.

Should it be day eyes and accurate vision, or night eyes and sensitivity? — that is the question that the ancestors of each kind of animal met and settled. Only a large animal can carry around an eye big enough to work well both night and day. Man has achieved this compromise, with a double system — one part like that of the robin; one like that of the nighthawk. The night-type of eye is vague, taking in general forms



The eye of the robin is a day eye. It is fitted for accurate vision when light is plentiful. At night the robin's eye is virtually blind.

PHOTOGRAPH BY THE AUTHORS

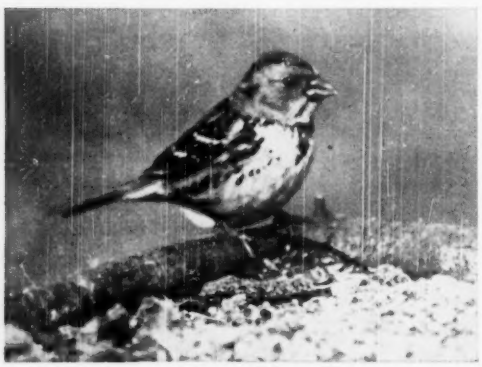
rather than details, and lacking any indication of color. The presence of a tree is plain, but small branches are beyond recognition. So far as sight is concerned, the owl can do only a little better in the dark than can we, although it catches a stomachful of agile mice each night. And the owl's eyes are so huge that they cannot be turned in their sockets. Instead, this bird rotates its head to change the direction of its gaze. Smaller birds and mammals have no space in their delicate skulls for large eyes As it is, the eyes crowd the brain seriously and limit development of the important reasoning centers. The comparative anatomist regards it as no coincidence that small creatures, such as most birds and mice, base their activities upon instincts — features of the hind brain. Their eyes occupy the forward regions of the head, and could not be sacrificed in order to make room for a thinking nervous system.

Nocturnal birds, other than the owl, have feeding habits like those of most night-faring creatures. They use their eyes to avoid obstacles in leaving the ground, but once in the air they depend upon "trawling" to obtain food in adequate amounts. The enormous gape of a nighthawk's bill is no accident. These birds fly through the twilight air with broad mouths opened wide to catch insects winging in their path. Nor are they particular in their diet. Small birds that stay up late, or fly early in the morning hours, often end their lives — in a whole condition — in the crop of nighthawk. whip-poor-will or chuck-will's widow.

Most birds, of course, are among the day-active creatures in attaining great precision of eyesight. Many have developed one small region in the eye where the image receives special magnification. This is a shallow pit in the retina, called a "fovea," and the cells that line it have each a private nerve fiber to the brain. Visual acuity reaches its maximum there, and the animal turns its head or eyes until any object of interest is focused in the fovea. Some creatures have two foveae in each eye. With one they examine objects to the side, but do so using the eyes independently, monocularly. With the other fovea of each eye thay can look forward past the beak or nose to use the two eyes together — binocularly — and gain thereby an impression of distance and depth. A few, like the owl, use the eyes binocularly at all times. But the owl's eyes, being designed for night vision, have no foveae at all.

The familiar kingfisher is one of the strangest users of the two-fovea system. Its eyes can both notice our presence, or the exact position of a fish below the water surface, and also follow that fish accurately after a sudden dive into the pond. Vision in air and vision in water are entirely different. When water comes into contact with the clear cornea that covers the iris and pupil, it takes away all the visual functions of the cornea. But in air the cornea is even more important than the lens of the eye in forming an image on the retina. In water the lens must act alone. Hence an eye that has normal vision in air is very long-sighted

The eyes of song birds such as this Harris' sparrow are equipped only for day use.



The night type of eye, such as the owl's, takes in general forms, not details; sees no color.

The eye of the kingfisher is a double mechanism, one for clear vision through air, the other for satisfactory binocular pursuit of a fish in the waters of ponds and streams. Two foveas make this possible, and the bird switches from monocular use of one to two-eyes' use of the other pair when it dives after its dinner.

PHOTOGRAPH BY THE AUTHORS

in water. And an eye that has normal vision in water is pathetically nearsighted in air. Penguins are famous for their myopic actions on land, but they see well in water. The kingfisher does far better, through possession of an egg-shaped lens. When the bird uses its eyes monocularly with one of the two foveae in each eye, any prospective prey is kept in sharp focus through one end of the peculiar lens. But when the kingfisher enters the water, and its cornea "disappears," the image of the fish is formed through another axis of the lens on the second fovea of each eye. The fish is seen binocularly, straight ahead of the beak, in good focus, and the bird is able to complete the catch. The kingfisher thus has two eye systems in one — an underwater visual arrangement that is hopelessly nearsighted in air but fine for binocular pursuit in the pond, and an aerial survey system with high visual acuity, that becomes useless when the bird dives after prey.

Perhaps the most sweeping generalization about birds' vision is that there are no avian kinds that are blind, or even poor in eye development. And no birds regularly inhabit caves to the exclusion of the outer air. Birds are primarily day-active, and they depend so completely on their vision that their eyes have developed remarkable acuity. Man, although niggardly in praise of most other creatures, admits this fact by lauding his fellows for having an "eagle eye" and admires the vision of the turkey buzzard, which can recognize a dying rabbit from a soaring point high above. In medieval times, when falconry was in vogue, the hunter took along a small bird to keep track of the falcon. The little bird — often a shrike — was caged and mounted on the falconer's saddle. Whenever the falcon was flown, the caged bird became excited and watched the hawk intently, long after the falcon had disappeared from human view. The actions of the small bird allowed the falconer to follow his trained tiercel and be on hand at the kill.

Thus the eyes of birds, although built on a design so similar to our own, represent, in most instances, the ultimate refinement of visual discrimination. They are linked by the optic nerves to a brain that is close to perfection in its complexity of useful instinctive behavior. Together — eyes and brain — they serve to guide the feathered creatures, to warn them of danger, to lead them to food, to mates and to shelter.

Antelope Before Ziklag

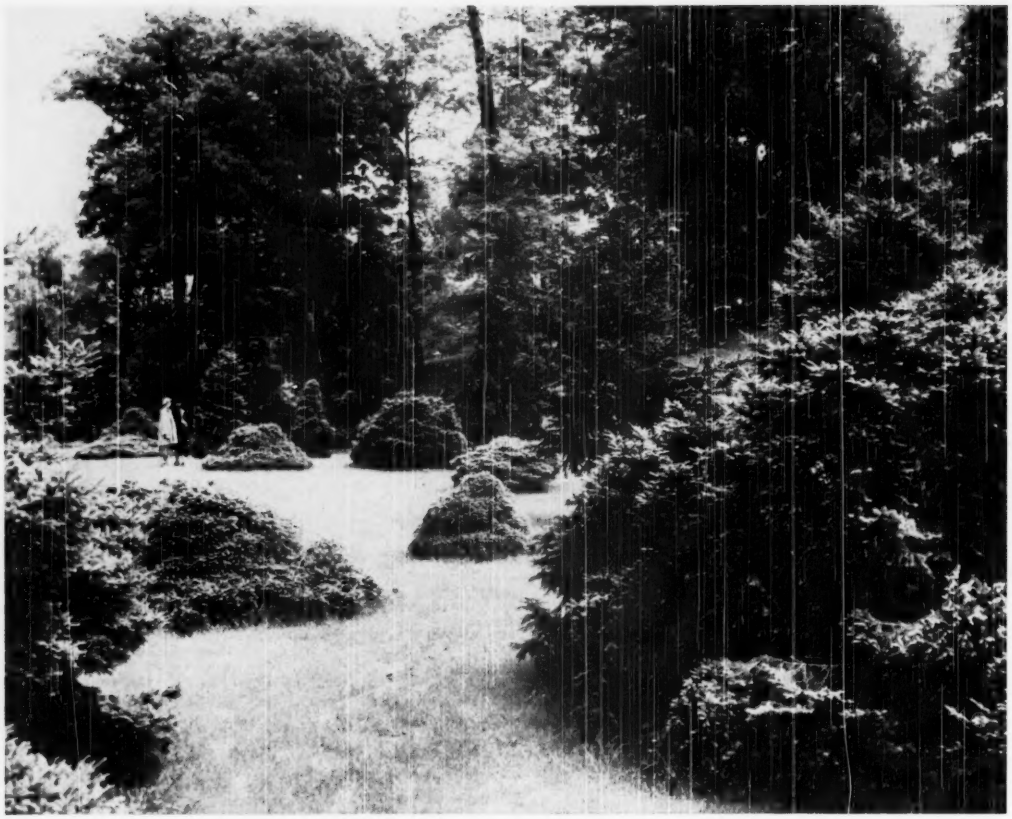
By CHARLES EDGAR GILLIAM

God fashioned me no hands for forging shields
To cringe behind. He gave me singing feet
To outheel evils stalking vales and fields
And win to grass and waters sweet.

Who raises walls to keep marauders out
Invites the thugs of nature to crash in,
And prisons with himself thin shades of doubt
That fleck his soul with fears and sin.

Lift none to rise between me and the dawn,
Or hide one rung the stars ascend at night.
I want no stone or brick, no hedge of thorn
To halt the dark or stay the light.

I'll wink my rest within the moatless waste
Of plains, or lie beneath some windwed tree
With sinews tuned to linger or make haste-
In love and death of shadows free!



Some of the conifers in the Montgomery collection at the New York Botanical Garden as seen from the far end of the planting looking towards the propagating house.

Grow Trees and Live Longer

By ANDREW S. WING

ONE of the most valuable collections of trees in the world was moved thirty miles to the New York Botanical Garden when the Montgomery Collection was officially offered for public inspection. These trees, pines, spruces or other cone-bearing evergreens, were the cream of a collection of more than eight hundred gathered over a period of twenty years by Col. Robert H. Montgomery, retired lawyer and tax authority, whose estate at Cos Cob in the Town of Greenwich, Connecticut, is nationally renowned. The specimens selected numbered only two hundred, the choicest and rarest specimens that he has collected and grown. Merely to move these beautiful trees, many of which are of mature size, cost $30,000, and the value of the collection would be hard to appraise accurately since many of the trees are rare and even unique in the United States, having been brought here from afar.

Meanwhile, Colonel Montgomery, a veteran of the Spanish-American War and World War I — when he served with distinction on the General Staff — has also turned his attention to tropical plants. He is the founder and director of the Fairchild Tropical Garden at Coconut Grove, Florida.

Relaxed in the spacious living room of his home in the rolling hills of Greenwich, he spoke interestingly and modestly of his experiences in running down the plants for his collection of rare conifers.

"I decided in 1928," he told me, "that if I would find a hobby it would add ten years to my life. As a boy I grew up in a small town in Pennsylvania and had a natural love for trees. Then I read an article in *The Atlantic Monthly*, by the late George P. Brett, president of the Macmillan Company, about the fun he had in building up his noted pinetum at Fairfield,

Dr. William J. Robbins, Director of the New York Botanical Garden, with Mrs. Montgomery and Colonel Montgomery, examine a dwarf spruce named after the Colonel.

Connecticut, so I decided to go in for conifers too. About the first thing I did was to get a copy of Liberty Hyde Bailey's book on evergreens. I made a card index of every tree listed, and then went to work looking for them. That was a bigger task than I had imagined. I searched all the likely nurseries from Pennsylvania to Maine, and found mostly the common, commercial varieties or species. I bought those, but what I really wanted were the rare and special kinds."

Having visited the Montgomery Collection at his home, as well as the one in the New York Botanical Garden, I can testify as to the Colonel's skill, taste and discrimination, both as a collector and a grower. He not only found the evergreens he wanted, often at considerable trouble and expense, but they are well grown and beautifully arranged. Horticulturists are agreed that it is his collection of dwarf and weeping evergreens, notably the spruces, hemlocks and pines, that is most outstanding. Some of these are extremely rare if not unique in this country.

Seated in his easy chair, he continued his experiences as a "plant hunter."

"There was a nursery, either in New Jersey or Pennsylvania, I forget which, now, that had a beautiful specimen of weeping hemlock. I didn't know it, but was so struck by its beauty that I tried to buy it. The nurseryman, a good businessman as well as a good plantsman, asked $1500 for it. I thanked him and said that if he ever decided to sell it for less than that to let me know. Not long after that he got in touch with me; said he needed some ready cash and would part with the hemlock for $500. That seemed like a good buy so I bought it and moved it to my place at Cos Cob." Cos Cob, by the way, the only town of its name in the United States, was named for an old Indian Chief who gave his life, along with 300 members of his tribe, in an early battle with the white men.

Colonel Montgomery continued to hunt evergreens, not only here but in Europe and other foreign lands. The deeper he got into the subject, the more interested he became. Actually he did not do so much traveling, but a lot of correspondence and catalog study was involved. For advice he called on leading tree experts and landscape architects. The thoroughness with which he pursued his hobby paid dividends in the results obtained. If he could not import a living tree, because of plant quarantine regulations, he would grow it from seed. He was fortunate in having an estate superintendent who was a first-class plantsman and propagator.

Evergreens that are not hardy in Connecticut were wintered over in a two-story greenhouse that opens off the living room. Here were grown such interesting and famous trees as the Cedar of Lebanon. World War II, and the resulting coal shortage, made it impractical to keep a large greenhouse going. And by that time the Colonel had started to spend his winters in Florida and had taken up another hobby — tropical plants. While the hardy evergreens were flourishing outdoors in Connecticut, he was basking under a tropical sun. He soon came to know David Fairchild, noted plant explorer and author, and former head of the Office of Plant Exploration and Introduction of the United States Department of Agriculture. Fairchild's enthusiasm for palms and other tropical fruits and ornamental plants was so infectious that it would have excited a much cooler plant lover than Colonel Montgomery. The two men "clicked" almost from the first, and a warm friendship developed, which brought about the founding of the Fairchild Tropical Garden at Coconut Grove, into which Colonel Montgomery threw not only his boundless energy and organizing ability, but also a generous amount of financial support. This tropical garden, which is not only a beauty spot and a trial ground for tropical plants from all over

the world, but also a research station, is a monument to both men, and also to Liberty Hyde Bailey, veteran plantsman and perhaps the greatest authority on palm trees in the world. The Colonel jokingly says that his two hobbies so far have extended his life twenty years, and now he is looking for something else to take up.

Mr. Henry Teuscher, Curator and founder of the Montreal Botanical Garden, and former dendrologist at the New York Botanical Garden, gave a learned and interesting appraisal of the Montgomery Collection, which he had visited many times in Connecticut, at the opening on May 26. He pointed out that such a collection has a practical as well as scientific value. Unless such private collections are made, many fine species or varieties may be lost, or at least remain in obscurity. Since arboretums and botanical gardens often lack the funds to build up such special exhibits, and nurserymen must necessarily devote their attention to commercial varieties, the rarer and more beautiful specimens, because they are slower-growing, or hard to obtain, or difficult to propagate, remain overlooked.

With fruits, vegetables, cereals, flowers, and other plants, constant work is being done by skilled and gifted plant breeders in the creation of new varieties through scientific cross-breeding. With the evergreens the job is mostly done by Nature, unassisted by man. New varieties are often accidental bud sports, and must therefore be propagated from living tissue rather than from seeds. Many of our finest ornamentals, as well as fruit trees, such as Stark's Red Delicious apple, have originated in this manner. But if someone able to judge the value of the new variety was not on hand, the strain might be lost, or at least delayed many years before being given to the public.

An interesting example of a mutation is the prostrate balsam fir, *Abies balsamea hudsonia*. This interesting dwarf tree was found near timberline in the White Mountains of New Hampshire. Unlike most timberline trees that are bent by the wind and kept low by the weight of ice and snow, this specimen was a true mutation and continues its dwarf habit when grown under normal conditions. Mr. Teuscher makes the interesting observation that probably a good many of the dwarf evergreens found in such regions as Newfoundland and northern Quebec may be sports rather than freaks of climate — survivals of the fittest, perhaps. But their true character cannot be known until they have been tested under normal conditions. A bud sport is different from a mutation in the seed, as it may occur in a single branch, a witch's broom for instance. Some of the fine-leaved varieties of evergreens, as well as fruits and other ornamentals, have originated in this manner. These bud sports may come true from seed, but usually do not. So they must be propagated by rooting cuttings, or grafting and budding.

The conifers include a good many large, rapid-growing trees. Colonel Montgomery measured the growth of one pine tree — it shot up forty-two inches in a single season. For that reason, perhaps, he was attracted by the dwarf and weeping varieties, which are slow-growing and never do reach a large stature. His collection of dwarf spruces and weeping hemlocks was one of the finest anywhere. But even these became crowded in time. The grounds of the Montgomery estate have been kept open only with a constant effort. It is costly to move large trees, and he hates to destroy a rare or beautiful specimen. Thus came the decision to share his collection with the New York Botanical Garden, with which he had been associated some time as an elective manager.

Alternating with the plantings are a number of ponds, on the banks of which grow graceful weeping and dwarf evergreens. It is very effective to have the fronds of a weeping tree trailing over the banks of a stream or pond. Flowering shrubs, mountain laurel, and deciduous trees have also been interspersed with the conifers so that the effect is not too dark or monotonous.

Colonel Montgomery is emphatic about the misuse of evergreens in the planting around small homes and in small gardens. "People don't think enough about the eventual size of a tree," he told me, "the result being that in a few years their houses are shut in by the larger forest trees such as pines, spruces and hemlocks. They must either be destroyed or cut back severely. It is always poor policy to mutilate a fine evergreen tree by constant pruning or clipping. If people would only learn to plant the dwarf forms, especially the yews, spruces, pines and junipers, they would have plantings around their houses that would be appropriate and in scale for many years to come. Nurserymen are partly to blame for this, as they sell people things for foundation plantings that belong in (Continued on page 162)

My Cardinal

By LUCY CABLE BILKE

From my window I saw
Beneath the yews, a glint of red;
So small, so still — "A dried oak leaf," I said.
Then looked again, went out and lifted him.
My cardinal was dead. Each tiny claw
Curled impotently; tail askew; each wing
Close furled to his soft body, once so trim,
And beautiful even in death. Now shall he sing
No more in the great white oak, whistling
His heart out to his lovely dusky mate.
My window was the instrument of his fate,
Crushing the tender, buoyant heart
He hurled against it in an ecstasy:
Inexorable, yet merciful, the dart
Of death, so swift he merely ceased to be.
His mate shall mourn him, I shall lay
His body in the comforting mother earth,
Whence we and all the little things have birth,
Whence we — and why not they? — shall rise
some day.

Emil Liers, the Otter Man

By PATRICIA MARR

★

Out for a stroll in the snow. Emil Liers is followed by his otters with just as much companionship as would be found with several pet dogs. Below, one of the otters provides evidence of its affection for its friend in a most human manner.

PHOTOGRAPHS BY GATTERDAM

IF YOU have ever received a letter from Emil E. Liers, you have seen his letterhead in large capitals, "Otters and their Friend, Emil E. Liers." And it is as impossible to do any research on the subject of otters without coming across the name Liers as it is to write about Liers without mentioning otters in nearly every sentence.

Everyone who has read *The Wind in the Willows* by Kenneth Grahame, or Thornton W. Burgess' famous stories, remembers Portly Otter and Little Joe. Ernest T. Seton, too, wrote about "the noblest little soul that ever went four-footed through the woods." But relatively few people, no matter how quiet and persistent, have ever seen an otter in the wilds.

This animal has been so ruthlessly trapped and hunted that one can count himself lucky to have seen even one. Yet today, at the Liers' farm in Homer, Minnesota, the visitor would be able to see seventeen otters, fat and sleek, splashing and playing in the water, and just generally having the time of their lives. Sunday is the big day at the Liers' farm. If the visitor stays all day, as I did, it is possible to count cars from far distant points in this country and Canada.

To stand by the big play pool and watch these rare and delightful animals, snuffling and grunting as they roll over

Tara, one of the Liers' otters, with the three cubs of her fourth litter. Emil Liers has demonstrated that it is possible to raise otters in captivity, in so doing covering ground that no one had covered before.

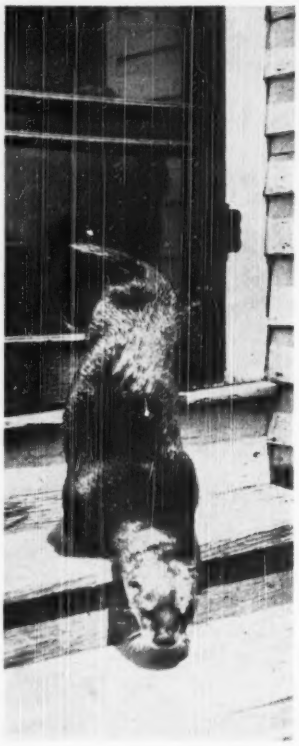
on their backs, perhaps a carrot between their fat little paws, is a treat. When they literally stand up in the water to get a better look at the queer humans, one would never guess how hard Liers has had to fight to keep, breed and publicize the otter as a beneficial eater of snakes, crawfish, eels, suckers and frogs.

Even after half a lifetime of work, almost thirty years, during which time Liers has proved over and over that otters are not responsible for the wanton destruction of trout, the controversy still rages. But as you look at Liers, you see a born fighter, a man you would not want to oppose.

Although nearly sixty, Emil Liers is a big man; big all over, with huge hands and a stubborn chin. He has a habit of fighting for what he wants, and getting it. When lack of money threatened to keep him from buying his original breeding stock from trappers, he mortgaged his house and bought the otters. When those otters died, either from injuries received in the traps or from his own lack of knowledge, he bought more, searched for his mistakes and took his otters to the best vets in the country. It was not easy. There was no one who had gone before him. He was the first to raise otters successfully, and he had to go it alone. Finally he arrived at a well-rounded diet, which is the basic secret that enables him now to keep otters healthy and happy where zoos and others still fail.

Liers is, indeed, a last-ditch sort of fighter, and the reason behind it is, I think, partly his feeling of guilt. Years ago, Liers made his living by trapping the very animals he loves most. To this day he is so ashamed that he cannot talk about it without choking up. The world has forgiven Emil Liers, but he will never forgive himself. And if he hears, even remotely, that one of the otters he has sold is not being well treated, he will move heaven and earth to get it back.

With the invitation "Let's go swimming," one of the otters comes through its special hole in the screen door ready for a trip to the swimming hole.



If you ever get in the vicinity of Homer, stop off and see Emil Liers. You will find him eager to teach you as much as he knows about otters. A lesser man would be bitter at the scorn and bad treatment Liers has received. The only man to keep otters consistently, and the first to breed them in this country, he can not help being angry when certain zoos refuse to listen to him and continue to lose their otters. But Liers is a Nature enthusiast and a conservationist, above all. He would like to see his successes copied for the otters' sake, and he wants the world to know and protect them from indiscriminate and ruthless trapping.

While I was visiting the otters and Mr. Liers, he answered every question patiently and fully.

"What about the way an otter will kill every beaver it comes across?" asked a man who had been reading a current comic strip.

As he was speaking, I watched an otter catch a frog, kill and eat it in a flash, then turn from his feast to rush and worry a large dog, all in the fun of the game. It was obvious no beaver could stand a chance against that suppleness and fighting strength.

Liers looked at the man, his face sphinxlike, only the slightest suggestion of a twinkle in his eye.

A study in animal life. Emil Liers poses with two of his otters, while Tuffy joins the group just to round out the picture.

PHOTOGRAPH BY YLLA

"Well," he said quietly, "don't you think if otters really attacked every beaver they saw, the beaver would be gone before now?"

Liers told me later that he knows from experience that this popular belief is false, because he has kept otters and beavers together without any harm to either.

"You know," he said, as we took a pair of fat, shovel-nosed otters for a walk to a pond in the woods, "lots of people, some of 'em millionaires, stop off on their way to the Mayo Clinic in Rochester, not far from here, and they tell me they're going for a weak heart or something. And I always want to tell 'em that what they need is to get out in the woods, sit down by a quiet pool and sorta take it easy. . .and enjoy life." He smiled again, that same smile he always has when he is answering a question for the hundredth time. "I always want to tell 'em, but I never do."

If Emil E. Liers comes to your town on his lecture tour, do not miss him. He will bring a pair of his otters along and they will swim and show off in a huge tank. You will not hear any polished, book-taught speaker, but a man, a true outdoorsman, and his otters — a man who has lived with these animals and knows them.

Spring Peeper

By RICHARD F. ARMKNECHT

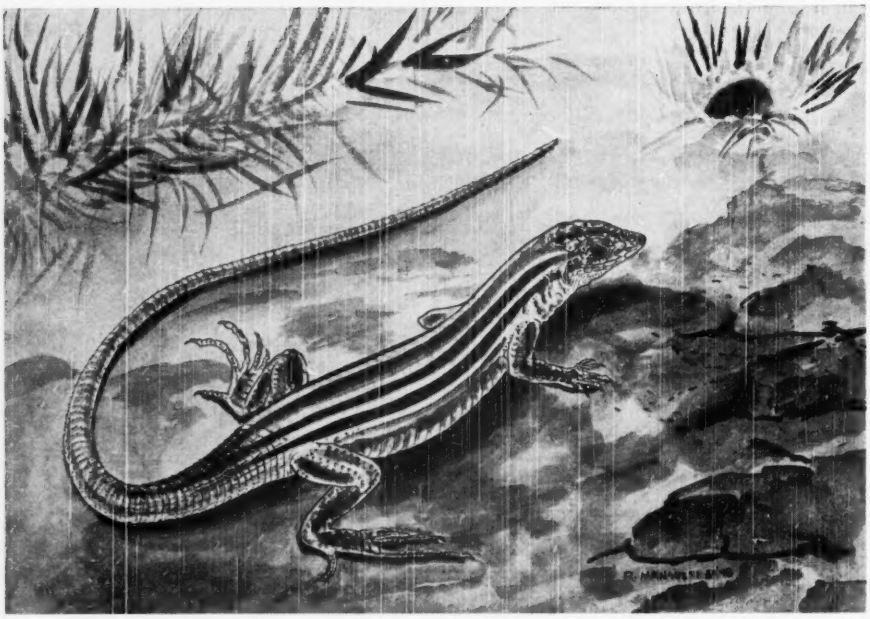
It is not truly marsh, though it pretends
To something of the sort in early spring —
Not six feet square, down where my garden ends,
But space for *Hyla crucifer* to sing!

To turn a dozen shovelfuls of earth
Would drain the place; but I forbear to dig,
Knowing for certain what his song is worth
Shrilling the winter's end when no brash twig

Considers leafing, when no venturous bud
Has wondered if it soon might dare the frost,
When spring is winter's legacy of mud,
And morning windows still are ice-embossed.

Then on some day no warmer than the rest
He will be there, his bubble throat blown out,
Hurrahing *Spring!* as if he were possessed,
Though most would think the issue still in doubt.

Sometimes I part the grass where he is hid
To see Saint Andrew's cross upon his back—
This small Crusader, crying out amid
My marsh for spring to muster and attack!



The six-lined racerunner waited intently as the ants moved busily back and forth from beneath rocks before it decided to "lap" them up voraciously with its tongue.

Six-Lined Racerunner

By ROMEO MANSUETI

Illustration by the Author

THE six-lined racerunner is a four-footed optical illusion inhabiting sandy wastes. First you see one, then you do not. You think Nature is playing tricks on you.

Stream-lined, with six bright yellow stripes, this lizard is the speedster of the reptilian world; so fleet that in racing-conscious localities it is appropriately called "sand nag." "Sand skeeter" is more descriptive of its almost insect-like dashes from one spot to another. Few lizards are more elusive and agile than this lithe, whip-tailed species. Although it is only nine inches, fore and aft, fully two-thirds of the total length belongs to the tail.

No creature is more truly a sun worshiper. On hot summer days, when the earth seems to simmer, and children prefer to swim while adults sip cool drinks in the shade, the racerunner frolics back and forth among stones, tufts of grass and bits of wood, foraging after insects. It is alert and restless, using its black, forked tongue to test objects that arouse its curiosity or appetite. It is at home on beaches, sandy roads, railroad beds, prairies, sparse woods, and other relatively dry localities. Rarely do these lizards enter areas that are heavily overgrown with brush or forest trees.

To bask, the animal selects a sunny, smooth spot, flattens its belly to the hot sand, and spreads its back to the rays. After a few flicks of the tail it lowers its head and snoozes with eyes closed. All this is accomplished in a few seconds; frequently such a sun bath will last only a few minutes. Then the lizard abruptly resumes its searches.

The racerunner is widely distributed throughout the southern and western United States, from Maryland to Florida, and from South Dakota to Texas, although it avoids high altitudes. Its altophobia is so developed that it is reluctant to climb shrubs or small trees, although if it resorted to this measure, rather than fleeing, it would be easier for enemies to catch. The lizards long toes, despite its claws, are adapted for skimming over the earth.

My fondest recollections of these lizards concerned trips to an area south of Baltimore. Here four or five other grade-school lizard-lovers, instead of fishing or swimming, migrated with me to chase "six-lines." We alternately stalked, corralled, and rushed to catch them, rarely coming home with more than two or three, and even these had broken tails. Our methods were crude, but we had fun and learned much about the animals'

habits. Besides, we had the satisfaction of knowing that our lizards were from the most northern locality in the East.

We found that heat was correlated with activity. In summer these lizards were not found in the open until after 10 A. M.; but, at noon and afterwards, there were myriad on all sides of us. After 3 P. M. their numbers dwindled. They were moderately wary, dashing away with great speed when we got within ten feet of them.

The lizards lifted their tails off the ground when running and actually used them as sort of rudders. A buddy remarked: "They look as if their tails are chasing them." As they sought food, their bodies dragged the long slender tails in cautious, somewhat jerky movements. Often we stalked individuals for as long as thirty minutes, getting as close as a foot from them; then, with one sudden streak, they were between our legs and into a burrow. We often speculated about the speed of six-lines, but I had to chase them in Texas while on army maneuvers seven years later to find the answer.

One bright Sunday, while on bivouac in a woods adjacent to a rolling, hilly prairie, I nagged a mathematically inclined G. I. into abandoning his "sack" to chase lizards. He took a small slide rule, his "pocket-knife," and grudgingly accompanied me to a sandy field nearby. At first we chased lizards from bush to bush without recording a uniform speed. Finally, by glancing at the second hand on our respective watches, and watching where the lizards started and halted — at the same time measuring this distance — we found that, although they are amazingly fast for their size, they can not match a top human sprinter. It took three seconds for them to travel fifty feet. My would-be Einstein, now fascinated with the problem, manipulated the slide rule a few times, then announced triumphantly: "Suh, this hyar *Cnemidophorus sexlineatus* moves at the rate of eleven miles per hour." Texas racerunners must have been slow on that day, for scientists have recorded other specimens running as much as eighteen miles per hour.

When a student of lizards decides to examine the stomachs in order to analyze their food habits, he is stymied in determining which method to use in capturing them. Professional collectors shoot them with .22-caliber dust-shot shells to collect a large number in a minimum of time, and this is the most efficient way.

A grown man stalking a racerunner is an undignified sight. After chasing one the collector becomes discouraged because, when it runs at full speed, its natural coloration blends with its surroundings and tricks the eye. It literally runs "like a streak." Then, without seeming to slacken speed, it stops short at the roots of a cluster of weeds, while the pursuer's eye continues in the direction of the interrupted course. He wonders what has become of the lizard. However, if one observes where the halt is made, snaring is possible by means of a fine noose of fishing tackle. By carefully advancing the noose it is often possible to encircle the lizard's head completely without frightening it away. A quick jerk and the noose tightens.

A "team" of lizard-hunters, aided by a long-handled butterfly net, is often successful in collecting the prey. When three pursuers corral a specimen between them from three directions a lizard becomes bewildered. A sudden lunge with the net will often cut off its escape. If the net misses, a lucky shortstop may nab the lizard in passing. In early morning or on cloudy or chilly days it may be found under rocks and pieces of wood. On beaches it may be found under driftwood. In Texas I caught one at 6 A. M. coiled under a flat rock on a hillside. It barely moved when I touched it. While on route march it became increasingly active in my pocket as the day progressed. When I finally placed my hand in the pocket at noon, the lizard nipped me sharply, causing me to yank it out of my pocket. It escaped into the bushes.

The six-line is one of the few creatures that makes naturalists feel ridiculous. On one occasion several inexperienced lizard-enthusiasts and I tried for two hours to capture one specimen. Nearby a slightly inebriated light-house keeper chuckled softly to himself. Finally he waddled away from his seat and selected a long stem of marsh grass, cut a slit at one end and inserted the opposite one, making a noose. Looking at us challengingly, he sighted a lizard, and approached it slowly, at the same time breathing heavily. Stalking it until only three feet away, he became rigid. Only his right arm moved as the green noose encircled the lizard's neck. He yanked and the lizard dangled helplessly in mid-air. The old sailor smiled broadly at us, and we humbly

Birds in Mid-Winter

By HELEN HIBBARD

I coaxed them with raisins, I coaxed them with crumbs.
I tried every kind of device,
And at last was rewarded by luring a number
Of birds which were all very nice.

They ate all my crumbs, and my raisins, and seed,
Their cries and their chirps filled the air.
I asked them politely what else they might need,
And all that I got was a stare.
But yesterday morning, with skies dark and gray,
The answer was easy to guess,
For out on my lattice at dawn was a jay,
On the porch were two red-birds, no less.

The jay raised his crest, and sat back on his heels,
And proclaimed in a voice shrill and clear,
"Come on, all you song-birds, I know how it feels,
But you really have nothing to fear.

Our mistress has set out a breakfast for kings,
To keep us from starving's her plan,
And hurry! For sure as a bird has two wings,
There's water, not ice in the pan!"

accepted his contribution of the captured specimen.

If lizards were judged for their dancing abilities, during courtship, the male six-lined racerunner would take the prize for a crazy rhumba. The mating season begins in May, a few weeks after hibernation. The male, whose sides are bright blue, starts things without stimulus from a female by moving his hips vigorously from side to side, rubbing the hindpart of his body on the ground in a figure eight. Dr. Hobart M. Smith, the leading authority on American lizards, has observed males to stop their dance to chase other lizards, not distinguishing between males and females. A male will attempt to ride the back of the pursued, nipping the skin in the neck region and scraping the back with the horny pores on the under side of the hind legs. The attentions are accepted by the females, but fought off viciously by males.

From early June to middle July the females are heavy with eggs. Numbering three to six, and superficially resembling white kidney beans, the eggs are laid underground in tunnels or under logs or rocks where the sandy environment is faintly moist. In August young racerunners, looking like tiny replicas of their parents, except for a bright, bluish tail, dart after tiny flies and ants. During the first few weeks they slough their skin frequently, growing rapidly. By late autumn they are almost two inches long.

A friend invited me to his cottage on a beach along the Chesapeake Bay to investigate the domestic life of the six-line. He discovered that, as the cat chased lizards across the sand, the latter seemed to vanish in thin air. Actually the lizards maintained "air raid shelters" of subterranean tunnels in the sand all around the house. I followed one sleek lizard with my eyes into a hole, about the diameter of a nickel, under a tuft of grass. I very carefully dug its burrow open by probing with my finger. The sand crumbled easily and I left an irregular path of about fifteen inches. The depth varied from three to eight inches. I dug frantically around the place but could find no lizard; apparently it had taken a side route.

Racerunners usually do not stray far from their burrows. Once as I strolled along a cement walk on a university campus in Fort Worth, Texas, a large six-line moved jerkily along the walk edge ahead of me. The lizard would move twenty feet, pause and turn its head around with a saucy expression. When I was about ten feet away, it continued its movements, then stopped again. All at once I dashed after it. Quick as a flash it made a wide arc around me and was gone in an instant behind me. I found a hole leading under the walk a few moments later.

During late afternoons, six-lines retreat into their burrows. On cold days they are apt to be found in these holes. Racerunners use their forefeet to remove the soil, but how many burrows are excavated during a season is unknown. Meadow mouse and mole runs are used extensively where the soil is not so easily dug. For hibernation, the holes are dug below the frostline.

Most of the six-line's activity is motivated by a desire to eat. During one afternoon a specimen was observed to capture and devour grasshoppers, crickets, flies, and caterpillars. The food is chewed rapidly and voraciously. Distasteful ladybird beetles, however, are quickly ejected if seized by mistake, and the lips are usually wiped on the ground, the lizard displaying great discomfort. During the height of its feeding activity, it darts from one victim to another in quick succession.

The six-line is fond of black ants. On a beach one was observed to station itself conveniently across the line of a foraging column and lap up the ants with its tongue as fast as they arrived. In captivity the racerunner will often feed on mealworms, sowbugs, roaches, and house flies.

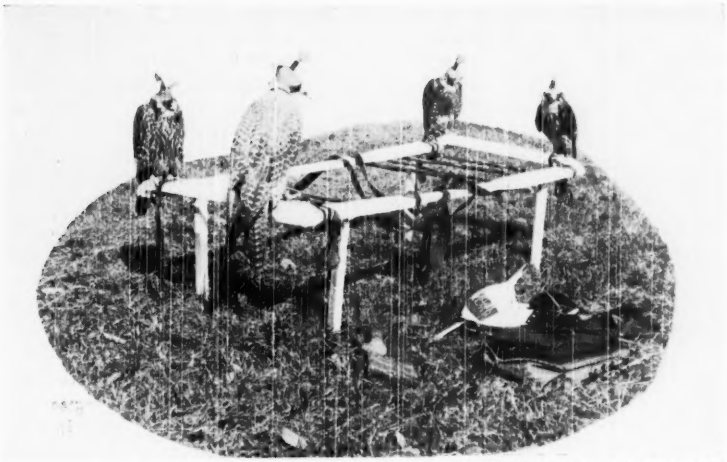
In Louisiana a soldier killed a black racer snake nearby, as I chased lizards. While stripping the racer's skin to make a belt, the G.I. opened the stomach and bared a partially digested six-line. Since he had grown fond of the "rascals," he later bemoaned the fate of lizards for being part of Nature's ruthless food chain. King snakes chase them into and through their burrows. Larger lizards, such as the collared lizard and greater five-lined skink, have been known to devour them also. In the latter cases, there is not much chance of the six-line being caught on open ground. The nematode threadworm is a more subtle parasite, having been discovered in the lizard's stomach.

In captivity the racerunner soon loses its alert, high-strung nature. It often becomes listless and thin, sometimes refusing the most tempting insects. It must be allowed to bask in direct sunlight for several hours a day in a sand-bottom terrarium, or else it wastes away.

Dr. Alexander Garden, a keen South Carolina physician-naturalist, supplied Linnaeus with the first six-lined racerunner when the struggling colonies were in the midst of repealing the Stamp Act. Earlier, soon after George Washington was born, the wealthy Dutch naturalist, Seba, figured it in one of his historic folios. Since then herpetologists have had continual headaches working with it and closely-allied relatives in sorting them out.

Today racerunners have swelled to about thirty species and subspecies from the United States to southern Brazil. Of the American racerunners, Dr. Hobart Smith remarked: "Few genera of the country have been studied and restudied with greater resulting disagreement than this." Since six-lines and their cousins easily adapt themselves to many diverse habitats, an amazing amount of variation of pattern with remarkably narrow generic limits has partially resulted, according to Dr. Charles E. Burt, who once tackled and analyzed the whole genus.

Although the six-lined racerunner is not of significant economic importance — the number of insects it eats is negligible — it should be protected for esthetic reasons. Try chasing six-lines; either you will have more fun "almost" capturing them — or, better still, you will catch a lizard, get sun-burned, and lose some weight.



PHOTOGRAPH BY WALTER R. SPOFFORD

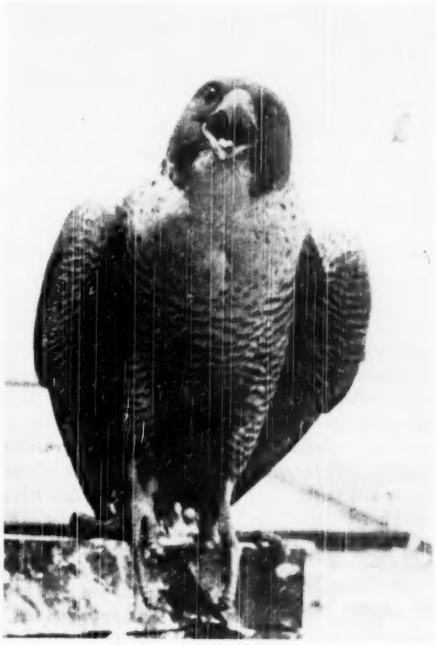
Hooded falcons on a cadge, together with other items in the paraphernalia used in the practice of falconry.

The "Sport" of Kings

By KATHLEEN GREEN SKELTON and DICK HERBERT

BY SOME time-honored concept falconry or hawking remains "the sport of kings," indulged in with considerable breastbeating and surrounded by the remote glamor of an Arthurian legend. Judging by popular articles on the subject, Genghis Khan, hawk hunting and a cavalcade of Mongolian burlesque beauties are still inseparable in the minds of many people. Few people realize that, when they see a balding, middle-aged man garbed in old army clothes and carrying a tired-looking brown bird in his station wagon, they are looking at one of the modern knights of falconry.

Several factors have contributed to give the "sport" an aura of snob appeal. Falconry articles are nostalgic with reminiscence of turbanned Indian royalty and with legends of medieval Europe, where ownership of a hawk was frequently restricted to the aristocracy and the nobility, the species of hawk being specified according to rank. Even today, the ownership of a hawk is, according to Mr. G. G. Goodwin, one of our leading falconers, "primarily a hobby for a man of leisure with reasonable means."



PHOTOGRAPH BY G. HARPER HALL

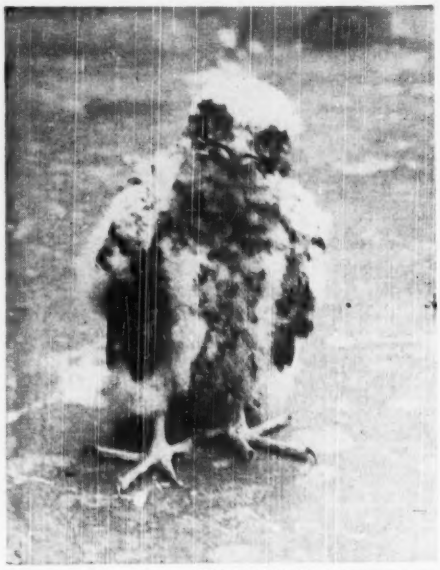
One of the peregrine falcons that nest and find sanctuary on the home building of the Sun Life Assurance Company of Canada.

Another element in the mystical glamor of falconry is its quaint claptrap — an ossified vocabulary replete with words like "manning," which suggest a peon touching his forelock to the master — and the curious paraphernalia of the sport. Twentieth century falconers no longer wear jewelled gloves, or, as one laments, "no longer can our falcons wear golden jesses," but volumes are written on "hawk furniture." The rudiments of these include a hood for the hawk, and strips of leather called jesses, which are attached to the bird's feet and joined together in a swivel (or varvel), to which a long leather leash is attached. A bell is fastened to each of the hawk's feet by a miniature

jess called a bewit, and much is made of the fine distinctions between Indian and European bells. The hood is a tight-fitting, leather cloche fitted over the eyes of the hawk to blind and quiet him. It is a rakish affair surmounted by a small, upturned feather duster, which has the curious effect of making the hook-beaked bird look like a militant dowager in an Easter bonnet.

But much the most glamorous feature of falconry is the hawk itself. Although several species of hawks are used, the bird universally preferred is the peregrine falcon, and it is to the plight of the peregrine that this article is devoted.

The peregrine nests by preference on a ledge of a high cliff overlooking the water. Perched high on a crag near her eyrie (or nest), the falcon (the female) is part of the wild majesty of the cliff, and very much its queen. Her head, hooded in dusky feathers, is regal and her look imperious as she sits motionless, the sun shining on her barred breast. In her lightning stoop, when she plummets on her quarry like a dive bomber, she attains a speed said to be 175 m.p.h. Even the male bird, which is a third smaller than the female flies in to take his turn at incubating the eggs with noticeable hesitation.



PHOTOGRAPH BY G. HARPER HALL

This is one of the young "Sun Life" falcons at an age when many are taken from the nest.

In medieval Europe peregrines were flown at game, but in this country the basic "art" of falconry is to turn the peregrine loose in an open field and, as he circles overhead, to release an "easy" bird; that is, a handicapped bird — usually a pigeon — for him to catch. An unhandicapped bird may escape the peregrine, so the pigeon or bagged game is ordinarily handicapped by the removal of primary feathers or by seeling, which means stitching its eyes shut, or sealing them with band-aid. Occasional falconers follow an old custom, after their hawk has captured the pigeon, of biting off the pigeon's head or breast and handing it to the hawk — a quaint ritual demanding strong teeth and a stronger stomach.

The sport of kings reaches an almost hysterical climax when the peregrine is flown loose at "game." Game, in the falconer's vocabulary, generally means songbirds — bluebirds, robins, meadowlarks, flickers, blackbirds, sparrows. In the United States it is illegal to fly hawks at ducks, and the peregrine, a long-winged bird of the open country, is unsuited for hunting pheasants and grouse in the thickets. Crow hawking is often acclaimed by falconers as the acme of their "art," but in a 1944 survey, covering a fifteen-year period and some four hundred peregrines, there were less than a dozen records of able-bodied crows taken by trained peregrines.

Despite the articles on the "supersportsmen" of falconry, a more unsporting procedure from the point of view of the handicapped bird can scarcely be imagined. Although American falconers do not go in for all the sadistic practices of the East, handicapping or seeling of the bird to be released to the hawk is common. Seeling of the eyes of hawks in training, particularly the accipiters, is also common. In an article in *The American Falconer*, John Craighead recommends seeling of all wild caught hawks for "usually a trained hawk associates some hurt or fear with the trainer."

Although many falconers eulogize their birds, hawks kept in the "noble tradition" are starved birds. The hawk's "condition" is the very essence of the sport, for if he is released in "too high condition" — that is, not hungry — he will fly away and not to his master's lure or game. His condition is "taken down" by fasting until his breast muscles show some shrinkage and his hunger will keep him from escaping. Trained falcons are believed to lack as much as 35 percent of the strength and ability of wild falcons, and one of the basic principles of falconry is that the hawk's condition must be "raised" — which means that he must be properly fed — in order to molt properly. His training is then completely revised; he is not flown at all, but is fed and rested in the mews — the attic or outbuilding where he is kept.

The training of the hawk is an ordeal accomplished largely through hunger, as the bird must be worked on an empty stomach. The first step is the "manning" of the bird. The hood is the answer to the wild, shy spirit of the falcon; a newly trapped falcon has a hood tied over her eyes, jesses, bells and leash attached, and the falconer carries her about on his gloved wrist for some hours. It is a matter of boyish exuberance among falconers to speak of the rigors of hawk training, and in an article in *Collier's* Mr. Ed Reid says that "for the first few days he (the falconer) carries the bird as long as he can without collapsing or going to sleep." It is not known whether this endurance contest appeals equally to the hungry hawk.

The falcon is unhooded for periods during the manning and trained to fly on her leash. She is trained to fly to a weighted lure — a piece of leather to which pigeon wings and meat are attached — and to feed from

PHOTOGRAPH BY CHARLES A. PROCTOR, FROM NATIONAL AUDUBON SOCIETY

The duck hawk and one of its youngsters. The peregrine is a fierce defender of its family and is on the lookout for intruders, but is powerless against human intruders.

the lure. In this way she learns not to fly away with the birds that she later kills. Last of all she is trained to fly to an unweighted lure as the falconer swings it round his head, and to "wait on" or circle over him.

In some emotional accounts one gets a picture of a hawk as a pet of many years standing. Actually most trained hawks die or escape within a few weeks or months. According to Mr. G. G. Goodwin, in an article in *Natural History:* "The majority of self-styled falconers merely keep a hawk as a pet and follow the usual routine of training until the victim dies from improper treatment or in an unguarded moment gains its freedom in flight." The loss factor in falconry is well covered in some of the issues of the now defunct *American Falconer.* In an editorial in July, 1943, Dr. Robert M. Stabler deprecated this: "Too many falconers are constantly overhawked. . . Some have a veritable stream of birds going through their hands during the course of a year. Such falconers maintain that many of their birds voluntarily fly off, are none the worse for their experience, etc. Without arguing the point, it is sufficient to say that there is nothing in support of such an attitude." In the same magazine Dr. W. R. Spofford wrote that: "Over 90 percent of falconers' peregrines return to the wild in less than a year. . . Whether these birds return to the breeding population is, unfortunately, not yet known." This would be worth knowing.

Another conscientious falconer, Richard M. Bond, wrote that out of 31 hawks he had had (not all of which were peregrines) 26 percent, or a possible 29 percent, died as a result of having been taken from the wild, while 32 percent escaped after a period of training, 16 percent were liberated, and 16 percent died as a result of mishaps which, the author believed, "were just as likely to have happened in the wild as in captivity."

Although the peregrine is not yet a threatened species, falconry, and its attendant publicity, does threaten the eastern breeding population. Always a rare bird, its breeding population is thinly scattered over extensive areas, and the most optimistic estimate of the population of all North America is somewhere between 5000 and 8000 birds. In an authoritative survey in 1942 Hickey mentioned a known breeding population of 350 pairs in the eastern United States, pointing out that this did not include unexplored territory in West Virginia and Maine. Even allowing for a population three times that figure, or 2100 birds in the eastern United States, it is obvious that the peregrine cannot stand much pressure on its numbers. Three years ago the number of falconers was stated by Mr. Ed Reid to be 1000, and it has been augmented since that time by the gushing publicity on falconry in the press, and even

Three young eyasses in their nest at one as yet undisturbed falcon eyrie.

PHOTOGRAPH BY DICK HERBERT

in such magazines as *Natural History*, the organ of The American Museum of Natural History.

Fortunately, not all these falconers own a peregrine, but all would like to own one. Although it is a fiction among falconers to speak of the desirability of owning short-winged hawks in eastern U.S. (as the peregrine is suited only for open country hunting), yet most prefer to own a peregrine and fly it to the lure. Many own two or three peregrines.

In May, 1945, *Nature Magazine* published an article by Dr. W. R. Spofford, a falconer himself but also a conservationist. Although urging the adoption of a code of ethics and regulations for falconers, Dr. Spofford defended falconers against charges of eyrie plundering and minimized the effect that they had had on the peregrine population. "In the last five years," he wrote, "less than a dozen eyasses (or young birds) per year have been taken from nests east of the Mississippi." He estimated that out of the 300 active eyries in eastern U.S. falconers could safely remove not more than one or two dozen without affecting the population.

As of 1949 it is safe to say that more than one or two dozen young birds are being annually taken from eastern eyries. Any estimate of nestlings taken must be purely hypothetical because there is a large turnover of birds by unknown persons. The number of eyries raided by these would-be falconers, attracted by the glamor of falconry, is, like the submerged part of an iceberg, the larger and more dangerous potential.

In 1945 Dr. Spofford pointed out that the vulnerable eyries in sanctuary areas were, generally speaking, sacrosanct, and as an example he cited six easily accessible eyries on the Palisades. These, for several decades, have been going concerns. As of 1949, this is no longer true. In the spring of 1949 only one young female was raised out of six eyries on the Hudson, which, in an average year, should yield at least six young, and, in a good year, twelve young birds. These figures are significant as an example of a sanctuary area where the birds are protected both by law and park regulation.

Accessible, unprotected eyries have always been vulnerable targets, and in an article in *The American Falconer* in 1942 Dr. Spofford admitted that: "Some eastern eyries had birds removed year after year, and sometimes the eyries over a large area have relatively few young left to take wing at the end of the breeding season." A visit to some accessible eyries in Vermont and New Hampshire in the late spring of 1949 revealed this pattern continuing, and inquiry from the townspeople usually elicited the information that falconers had removed, or attempted to remove, young birds for some years past. Only 50 percent of the ecological habitat was occupied by any pairs of peregrines.

A still greater hazard was the interest in falconry that these visits had inspired. At one particularly accessible site, where a white New England village leans against the cliff, one can look up at the eyrie from the road. As soon as we took out binoculars a teen-aged boy ran up to point out the eyrie and offer to guide us up the cliff. He had taken several "parties" from the city up to "band" the birds (a euphemism common among falconers at an eyrie), he said, and he hoped to get a peregrine himself.

It was here that we encountered the Sancho Panza of falconry, a plump twelve-year-old who ushered us solemnly into his "mews" to see his "bird." The mews was an old stable, complete with chicken-wire cages, post, jesses and leash. His "bird" was a young crow whose tail feathers were almost beaten off against the wire cage. The child solemnly wrapped a wool scarf around his wrist, preparing to fly the bird from fist in the noble tradition. Ignoring the little wrapped fist and following the recalcitrant tradition of all the clan *Corvus*, this noble bird slipped through the cage door and dropped to a clump of grass where, lusty and unmanned, he screamed for dinner until the children brought him bread and milk.

Sancho Panza told us that he had exchanged a half interest in a sparrow hawk plus $1.50 for his crow. Another child in the village had three sparrow hawks that he was training, and a third had one. The uncle of one of the boys had taken two young peregrine, which died within a month.

Spectacular as is the robbery of an eyrie — a deed accomplished with melodramatic furtiveness — a more serious threat is the trapping of adult birds. Migratory peregrines are trapped at many points, but much the most famous place is Assateague Island, a barrier reef off the coast of Maryland and Virginia. As Maryland does not protect the peregrine, trapping is legal on the Maryland half of the island. Assateague, in the fall, is a falconers' mecca; there is a large hawk flight and a flight of about three hundred peregrines, most of them passengers, or birds of the year, (Continued on page 162)

Formulas, the Poetry of Science

By E. LAURENCE PALMER

This is the fifty-fifth in NATURE MAGAZINE'S *series of educational inserts.*

In *The Common Ground of Poet and Naturalist*, J. G. Needham writes: "If a botanist and a poet study a flower, I take it to be the purpose of the naturalist to interpret its meaning in terms of plant life, and of the poet to interpret its meaning in the terms of human life. The work of the botanist will appeal first of all to the human intellect; that of the poet, first of all to the emotions. But the work of both, if well performed, will justify itself to the common mind. Both begin by observing things; both continue by comparing things; and both end by interpreting things. Each has his message and although the two messages may be called by names as different as a genetic hypothesis and a sonnet, both may be derived from the contemplation of like materials, and may be reached by methods that are not fundamentally different. At bottom, poetry and science have common features. They use the same raw materials, and it is these that, of all people in the world, only poets and naturalists (in the broadest sense of these words) care for things that are common, and homely, and near at hand, and commercially valueless."

Dr. Needham goes on to point out the differences between real poets, who express themselves with reasonable exactness, and the sloppy type that generalize too freely. Fortunately, he does not express himself in connection with the efforts of many ultra-modern poets. A. A. Milne in his autobiography says of these: "In my day poets said what they had to say in song. This song (poetry it was called) demanded rhyme or, at least rhythm from its devotees, and in consequence was hard work. It was obvious, therefore, that if you were to improve poetry you would improve it most comfortably by omitting the things which were difficult to manage—rhyme and rhythm — and concentrating on what might come to anybody, inspiration."

There is a poetry in exactness that many so-called poets do not appreciate. This is somewhat like the beauty of perfection, the wholesomeness of goodness, the dignity of justice, the fundamental soundness of integrity, and the satisfaction that goes with honesty of the good old-fashioned type.

Many modern artists in the field of poetry, art, music, and literature claim that their efforts are not appreciated because others have not raised their understanding to the proper point. Others, with superior ability as salesmen, consider that the cash register is the only satisfactory measuring device to determine the difference between the moron and the genius. Still others throw aside whatever native ability they must have and go with the crowd, no matter how much this may be contrary to their natural good judgment. They measure their support by the percentage they can see coming back to themselves.

There is a beauty in exactness that the scientist commonly expresses in symbols and formulae. These are just as much gems of human observation and expression as are the apt phrase of the poet, the unique technique of the musician, or the exceptional interpretation of the true artist. To the scientist, they are fundamentally or primarily "commercially valueless" but professionally gratifying, no matter how much money they may earn incidentally.

It is because I feel that readers of these inserts should see something more in the formulae of the scientists than hurdles to be leaped in an examination, that I venture to devote one insert to a consideration of some common or even unusual formulae and symbols. Through the years, I have felt that, at intervals, we should have an educational insert that stepped out of the common pattern and presented some different slant. We had, for example, inserts on hearing, on age, on outdoor living, on tracking. Many of these may have been useful in integrating the content of the standard inserts. It is quite possible that this unit may be similarly useful. Some may protest that if, as Needham said, the poet appeals "first of all to the emotions" that a bare formula that may seem to be wholly unemotional cannot possibly be considered as poetic. This, of course, depends on what may affect your emotions. Needham did not say that the only poetic appeal was to the emotions. I have known scientists who were on the verge of reducing lengthy studies to a simple formula whose emotional status certainly was not too stable at the moment. I rather think that considering formulae as the poetry of science combines what Dr. Needham suggested by bringing in both emotion and intelligence, and that there is something emotional in appreciation of a perfect formula. This emotion might well be cultivated by some sloppy workers in science. Rupert Brooke spoke of "the keen unpassioned beauty of a great machine," and must have seen beauty in the perfection of at least some of the works of man's hands. Can we not see similar beauty in the perfection of the work of man's mind. To me a perfect formula is something like *Ave Maria*, a Fuertes painting, a Shakespearean play (if you will let me select it) or a Hoover dam. I can see beauty and appropriateness in the name Hoover for a dam that I cannot see in the name Boulder. Like a formula, it tells so much.

In writing this insert on formulae and symbols, I am electing to step aside more or less from the beaten path. Every reasonably educated person has some appreciation

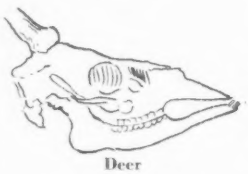
of the commoner formulae used by chemists and physicists. I therefore elect to reject them from consideration here. Not many appreciate that, in the less exact sciences, there are generally accepted formulae that present significant situations more succinctly than pages of prose. True, there are many who elect to offer invalid formulae as substitutes for common sense but previously in these pages we have considered the efforts of such persons.

It seems reasonably worthwhile that our naturalist readers get some acquaintance with formulae that appear frequently in literature; that often are not understood, and possibly to suggest the consideration of other formulae and symbols that need greater perfection, and which can be improved by any reasonable person with suitable experience. To this end, we review here a few types of formulae and symbols. These deal with the tooth formulae to be found in mammal skulls, the fin and scale formulae of fishes, track formulae and gait symbols for mammals, and floral formulae for the flowering plants. We might have added formulae dealing with wing venation in insects, with population development, with the erosion of soil by water, and so on. It is possible that we have deliberately presented for your consideration first those that can be most easily understood.

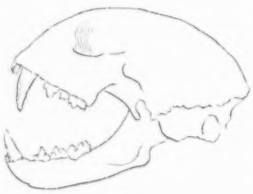
Beaver

Dog

Opossum



Deer



Lynx

Tooth Formulae in Mammals

If you will consider the punishment your teeth must take during the greater part of your life, you will realize that they must be composed of highly durable material. Since they are of this type, they may be the last things to vanish when a body decays, even though they may be lost during life because of neglect, poor nourishment or accident.

Skulls and teeth are frequently acquired by amateur naturalists, and this page is devoted to starting such persons to form some sensible judgment as to the class of mammal that formerly owned a skull that may be found. Incidentally, too, it may help you see why mammalogists like to see the teeth of a mammal they may be asked to identify, either as teeth in a dead carcass or as they may appear in the food remains of other animals. Owl pellets frequently contain the teeth and skulls of small animals that have been eaten. The stomach contents of foxes and other predators frequently include teeth of animals. To help understand the importance of predatory birds or mammals, it is worthwhile being able to identify the skulls and teeth of mammals. If every farmer or sportsman who killed a hawk or owl would intelligently examine the bones found in the birds' stomachs there would be fewer hawks and owls killed.

If you are a middle-aged or average adult person you probably have most of your natural teeth. Since you will not have to go far to get a specimen with which to work, suppose you start on understanding mammal teeth by examining our own and let us write a formula for these teeth as we go.

Beginning on the upper jaw in the center you will find on each side two chisel-shaped teeth, the *incisors*. We can write this in a formula as I 2, the I meaning *incisors*. On the lower jaw on each side, there are two other similar incisors. We can put these into our formula as follows: I 2/2. This means we have 2 incisors on each side of each jaw, or a total of eight. Next to the incisors is a single sharply pointed tooth. There is one of these on each jaw on each side, so we now have a formula like this: I 2/2, C 1/1. In this case, the C stands for *canines*. Already, we may read some significance in these types of teeth because we have heard the rodents spoken of as the chisel-toothed tribe, and of course we have heard of canines, which have given the name to the group to which our dogs belong. There are great groups of mammals that have no canines, and other great groups that lack at least some of the incisors, or all of them. Any formula that you might read could quickly show these differences.

As we proceed on our jaws backward from the canines, we find that the next two teeth on each jaw on each side are inclined to have two peaks, one in front of the other. These are spoken of as the *bicuspids*, or, since they are in front of the remaining *molar* teeth, they are frequently called the *promolars*. So far now our formula for our own teeth would be: I 2/2, C 1/1, P 2/2. If we count the usual number of molars and add them, we will have our complete formula as follows: I 2/2, C 1/1, P 2/2, M 3/3. This means that on each side of each jaw we have two incisors, one canine, two premolars and three molars.

If you will look through the formulae further on, examining only the reported incisors, you will find that usually the more primitive mammals have a larger number of incisors than do those highly specialized. There are a few exceptions, but this rule holds rather well. This may help give you a hunch about the group to which some skull you find may have belonged.

As far as the canines are concerned, you rarely find more than one to a side on each jaw, and frequently find none.

It should not be necessary to carry this further, but if you will add up the totals represented in each of the formulae you will see that, with some exceptions, many teeth are the rule in the primitive groups and fewer teeth in the more highly developed.

Here are some of the more typical dental formulae of

some of the better known groups of mammals. Once you have the knack of interpreting these formulae you will find that they help you express fundamental differences quickly and reasonably accurately. Because of this, they are worthwhile modes of expression.

Opossums are our most primitive mammals. Judging from what we have been saying, their dental formula should indicate a large number of teeth, and, particularly, a large number of incisors. Here we are: I 5/4, C 1/1, P 3/3, M 4/4. This is a total of 13 teeth on a side on the upper jaw and 12 on the lower jaw on each side, or 50 teeth in all. No wonder an opossum can eat a great variety of foods, can succeed and is spreading his range. Of course the combination of a short gestation period and large litters help in this matter.

There are groups of mammals that eat insects for the most part. The moles burrow underground after them. The shrews pursue them on the surface of the ground and even in the trees, and the bats fly after them through the air. An examination of their dental formulae will show how they differ from the opossums and from each other and yet as a group differ somewhat from the others we will discuss later. Here they are:

Common mole: I 3/2, C 1/0, P 3/3, M 3/3; short-tailed and common shrews: I 4/2, C 1/0, P 2/1, M 3/3, red bat and some others: I 1/3, C 1/1, P 2/2, M 3/3.

We read that the raccoons are the little brothers of the bears. Let us see how their dental formulae compare, and how they differ from those we have suggested so far.

Raccoon: I 3/3, C 1/1, P 4/4, M 2/2; bears, black, grizzly, polar: I 3/3, C 1/1, P 4/4, M 2/3.

This bear formula, you will see, is identical with that of dogs, foxes, coyotes and wolves, and differs from such mustelines as the skunks and badgers only in the molars and premolars. The formula for these mustelines is I 3/3, C 1/1, P 3/3, M 1/2.

Cats are much like dogs and bears, so far as their teeth are concerned, but the differences here show up thus: I 3/3, C 1/1, P 3/2, M 1/1. Many seals have a formula of this type: I 3/2, C 1/1, P 4/4, M 1/1, while the related walrus with his conspicuous tusks shows up this way: I 1/0, C 1/1, P 3/3, M 0/4.

Canine teeth have been present on both upper or lower jaws of most of the animals so far considered. There are some major groups in which they are absent. These include the rodents, Rodentia, the group to which the hares and rabbits belong, the Lagomorphs, and the deer. Some others might be included in this list but for certain reasons are not. Of the groups suggested, the main differences are that in the rodents the incisor formula is invariably 1/1; for the Lagomorphs, which include the hares and rabbits it is 2/1, and for the deer it is 0/4. Except for the elk and caribou, in which there are single canines on the upper jaw, most of the deer have this formula: I 0/4, C 0/0, P 3/3, M 3/3. Some mammalogists make a different interpretation of the nature of one of the four incisors. In the rodents, we have these variations:

Woodchuck, red, gray and flying squirrel, chipmunk and spermophile: I 1/1, C 0/0, P 2/1, M 3/3. Fox squirrels, pocket gophers, beavers, porcupines and kangaroo rats have only one premolar instead of two in the upper jaw, and mice and rats have none in either jaw. The mouse and rat formula, then, is I 1/1, C 0/0, P 0/0, M 3/3. These are the imported genus *Mus*.

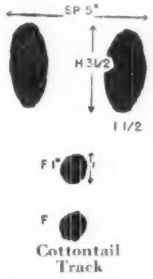
The formula for horses is interesting and variable. It may be as follows: I 3/3, C 1/1, P 3/3, M 3/3. This would give a total of 40 teeth. However, we find some horse skulls with 36 or 42. Mares rarely have the full 40 and some males have an extra pair of "wolf teeth" that make their total 42. It may interest some of you to look over some old horse skull to try to determine the sex of the animal.

Armadillos have interesting formulae like this I 0/0, C 0/0, P and M combined 8/8. True whales carry the dropping out of teeth to such an extreme that their formula is I 0/0, C 0/0, P 0/0, M 0/0. This formula does not hold for dolphins and many whales like the sperm whales, which are hardly considered as true whales.

Get the habit of writing the tooth formulae of skulls that you find on your hikes and you will develop a worthwhile and interesting hobby, and a better understanding of some important developments that have taken place in the mammals through the ages.

Track and Gait Formulae and Symbols

If you do not think it is necessary to rely on some exact and brief form of description, such as formulae and symbols offer, try to explain to someone the difference between such a simple thing as a trot and walk for a horse. If you think some similar short cut is not worthwhile, try quickly, without the help of a drawing, to distinguish between the tracks left by a fleeing gray squirrel and a cottontail rabbit.



Let us start with the rabbit track. A single complete series of tracks left by the feet of a rabbit show, of course, that the larger hind feet are paired, while the tracks made by the smaller front feet are placed one behind the other to form with the hind foot tracks a sort of Y. In spite of what you may find in certain widely distributed wildlife pictures, the smaller front foot tracks are placed behind the larger tracks of the hind feet and the rabbit goes away from the direction indicated by the front foot tracks. We cannot indicate all of this easily in a formula, but we can indicate something of the size of the tracks and certain other things. To indicate the tracks of the *front* feet, I use the simple capital F. I follow this by the measurement in inches. Thus F 1 x 1 means that the front foot tracks measure in average tracking snow 1 inch by 1 inch. Following this, of course, you can easily interpret the *hind* foot tracks as H 1½ x 3½. I follow this still further with Sp 5, indicating that the *spread* between the paired tracks

is 5 inches, and with L 84, indicating that a good *leap* may be 84 inches. Frequently I follow the track measurements with another figure indicating the number of toes showing. In a raccoon, for example, he would have F 2½ x 3, 5, H 2½ x 4, 5, indicating, in addition to size, that both front and hind feet show 5 toes. This is important in distinguishing the difference between a track of a raccoon, which shows 5 toes on the front foot, and a woodchuck with 4.

One other character distinctive in tracking that can well be recorded in simple form is the *stride*. This is important in distinguishing tracks of cats and foxes in some kinds of snow. A cat's usual 6-inch stride is indicated St 6, while a gray fox might read St 16, and a red fox St 18. The stride of course is here considered as the distance between two adjacent tracks not the distance between two tracks of any one foot.

With these as helpers, here are a few quick ways of describing the tracks of some common mammals. You should be able to read and interpret all of these, and will find it a convenient way of remembering these points.

Opossum, F 1¼ x 1½, 5; H 1¼ x 2½, 5; Sp 6. Blarina, F ¾ x ¼, 4; H ½ x ½, 5. Raccoon, F 2½ x 3, 5; H 2½ x 4, 5; St 7; L 20. Black Bear, F 3 x 4, 5; H 4 x 7, 5. Grizzly Bear, F 4 x 6, 5; H 5 x 12, 5. Marten F ¾ x 1½, 5; H 1¼ x 2, 5; Sp, 4; L 36. Fisher, F 3¼ x 2½, 5,; H 1¼ x 2 ,5; Sp 4, L 36. New York Weasel, F 1 x 1, 4; H ½ x 1½, 4. Mink, F 1½ x 1½, 4; H 1½ x 1½, 4; Sp 5; L 24. Skunk, F 1½ x 2, 5; H 1½ x 2½, 5, St 5. Gray Wolf, F 4 x 5½, 4; H 4 x 5½, 4. Coyote, F 3 x 3½, 4; H 3 x 3½, 4. Red Fox, F 1½ x 2, 4; H 1¼ x 2, 4; St 18. Gray Fox, F 1½ x 2, 4; H 1¼ x 1¾, 4; St 16. Domestic Cat, F 1¼ x 1, 4; H 1 x 1, 4; St 6. Woodchuck, F 1½ x 1¼, 4; H 1¾ x 1¼, 5; Sp 5. Eastern Chipmunk, F ½ x 3/8, 5; H ¾ x 1¼, 5; Sp 2. Gray Squirrel, F 1 x 1⅜, 5; H 1¼ x 2½, 5; Sp 3¾, L 60. Fox Squirrel, F ¾ x 1¾, 5; H 1 x 2, 5; Sp 6; L 60. Red Squirrel, F ½ x ¾, 5; H 1 x 1¾, 5; Sp 3, L 36. Flying Squirrel, F ½ x ½, 5; H ¾ x 1¼, 5; Sp 2. Deer Mouse, F ¼ x ¼, 5, H ¼ x ½, 5; Sp 1¼. Meadow Mouse, F ½ x ½, 5; H ½ x ¾, 5; Sp 1. Muskrat, F 1½ x 1¼, 4; H 1½ x 3½, 5; Sp 3; St 8. House Mouse, F ¼ x ¼, 5; H ½ x ¾, 5; Sp 1½. Norway Rat, F ½ x ½, 5, H ½ x 1½, Sp 4. Beaver, F 2½ x 3½, 5; H 5½ x 7, 5; St 16. Porcupine, F 2½ x 3½, 4; H 2 x 4½, 5; St 12. Jack Rabbit, F 1½ x 1½; H 2 x 3½. Cottontail, F 1 x 1; H 1½ x 3½; Sp 5; L 84. Whitetailed Deer, F 2 X 3½, 2; H 2 x 3, 2. Elk or Wapiti, F 3½ x 4½, 2, H 3¼ x 4, 2. Moose, F 5 x 7, 2; H 5 x 7, 2. Antelope, F 2 x 3, 2; H 2 x 3, 2. Mountain Goat, F 2¾ x 2¾, 2, H 2¼ x 2¾, 2. Mountain Sheep, F 2¾ x 2¾, 2; H 2¾ x 2¾, 2.

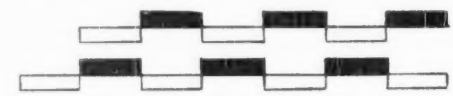
It should be obvious that track formulae may be merely suggestive. A given track may, in a few hours, increase in size if it is made in melting snow. Also, it must be remembered that the number of toes recorded in the formulae indicates only the number of toes that show in the tracks, not the number of toes present on a foot. The tracks do not, of course, remain constant in a given species if there is an individual variation in numbers of toes.

Gaits

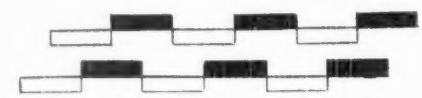
There are a number of ways in which the gaits of horses are represented graphically or numerically. One dictionary numbers the feet of the animal, and then gives a series of numbers, indicating the order in which the different feet strike the ground. This may be a satisfactory procedure, but, on the whole, it seems more difficult to interpret than other devices. Let us see how these two compare. You can then elect whichever meets your convenience. Obviously, either is briefer, more easily understood and possibly more accurate than a long verbal attempt at explanation. Because of this, they qualify for consideration in this article.

Let us take the pace, rack or amble and see what the two systems will do with it. In the diagrammatic method, we indicate the right feet by blank squares and the left feet by solid black squares. In the numerical system, the left fore foot is number 1 and the left hind foot number 2. Correspondingly, the right forefoot is number 3 and the right hind foot number 4. In the numerical system, we indicate the changes that take place in the feet that are on the ground. In the pace, for example, we may start with only the right hind foot on the ground. The number 4 indicates this. Then, the right front foot comes down and is on the ground with the corresponding hind foot, so we follow the 4 with 42, separating the two by a comma. This is followed by the behavior of the left feet so that for the pace we have the following formula: 4, 42, 0, 3, 31, 0, 4 and then repeat. Diagrammatically, this same behavior can be indicated as follows:

Pace 4, 42, 0, 3, 31, 0, 4



Trot 2, 2, 3, 3, 0, 1, 14, 4, 0, 2

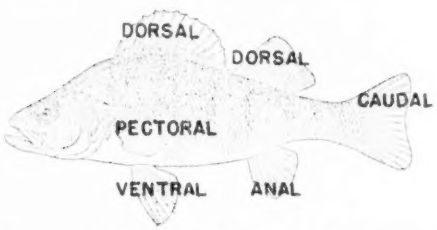


Walk 314, 14, 142, 42, 23, 231, 31, 314

Frankly, I prefer the diagram although you may differ with me in this.

Fun with Fin Formula

Anyone who has caught suckers and catfish, or minnows and sunfish, knows that the fins of the suckers and minnows are soft and harmless, while the fins of catfish and sunfish are provided with spines that can seriously injure a careless finger or palm. In addition to these conspicuous differences, there are many of a more minor nature, but in a given species of fish there is usually enough constancy so that the nature of the fins may be of importance in making an identification. At least, the nature of the fins may contribute to other evidence provided by scales, teeth and other structures to make an identification stick. Obviously, in an article dealing with short cuts, such as are provided by symbols and formulae, we want to call to your attention and to help you understand. Unfortunately, there are some ambiguous structures in the fins of fishes, and, also unfortunately, not all authorities have used the same terms to identify the different fins. It is not always simple to distinguish between a spine and an unbranched soft ray supporting a fin and this may lead to some confusion. When the terms *pelvic* and *ventral* are used to identify the same fins, this makes trouble. But in spite of these difficulties, fin formulae are helpful and should be understood by any naturalist interested in making careful identifications.



We cannot here discuss all of the fins of fishes but will confine ourselves to those of major importance. These of course are the fins on the back, known as the *dorsal* fins; the tail fin or *caudal* fin; the unpaired fin along the bottom of the fish usually just behind the vent known as the *anal* fin, and the two sets of paired fins. The paired fins are the *pectoral* fins, which are usually placed well forward, and the *pelvic* or *ventral* fins, which are variously placed but usually to the rear of the pectoral fins. These fins are usually designated by initial letters thus: dorsal, D; caudal, C; anal, A; pectoral, P or P_1 and ventral or pelvic as V or P_2. If, as is frequently the case in the dorsal fins, there are two or more fins of the same type, the first fin is the one to the front. We speak then of first dorsal and second dorsal, or D_1 and D_2. Reference to the sketch should locate these fins on a typical fish.

As anyone may see, the fins of fishes are supported by rays of one sort or another. There are spines and soft rays. Usually, the soft rays are branched, but this is not always the case. The number of supporting rays and the kinds of each are reduced, or indicated in a fin formula by using Roman numerals for the spines and Arabic for the soft rays. It is not common to indicate in a fin formula whether the rays are branched or simple, nor is it common to indicate the nature of the tail or caudal fin in a fin formula unless for some reason this is particularly important in making an identification. In the catfishes, pikes and salmons, there are many rudimentary rays, some of which may not be easily seen or counted. These are counted whenever possible and included in the total. Where a single fin contains two kinds of rays, the kinds are counted separately and the numbers separated by a dash. Now let us see how a fin formula would look. Ordinarily, the formulae for the dorsal fin or fins, and the anal fin, are the only ones given.

The common yellow perch formula reads as follows: D. XIII to XV, 13 to 15. A. II, 7 or 8. The dorsal and anal fins are important in the identification of this fish. The D. XIII to XV, 13 to 15 means that the first dorsal fin is composed of 13 to 15 spines. The second dorsal is composed of 13 to 15 soft rays. In the anal fin of this fish, by the same logic, are 2 spines and 7 or 8 soft rays.

Now for practice in this thing, let us read a sort of fish chowder of fin formulae. Each of the following belongs to a species that is well-known to the average fresh-water fisherman, or is most common in the literature of the average sporting magazine. You should be able to picture the fish and possibly tie the formulae into the following list of fishes, here represented.

(1) D 10 to 12. A 10 to 14. (2) D 10 A. 9. (3) D 12. A 7. (4) D XII to XVI, 19 to 21. A II, 12 to 14. (5) D 16 or 17. A 13 or 14. (6) D 14. A 13. (7) D XII or XIV, 14. A 7 or 8. (8) D 17. A 15. (9) D 11, 18. A II, 7. (10) D 8. A 8. (11) D VI, 15. A VI, 18. (12) D III, 17 to 21. A III, 5. (13) D 11 or 12. A III, 10 to 12. (14) D 1 6. A 21 or 22. (15) D X 13 to 15. A III 10 to 12. (16) D X 12 or 13. A III 10 or 11. (17) D 16. A 19.

The fishes represented are as follows. Try to identify the names with the formulae. They are not given in the same order in the two lists.

Alewife	Crappie	Pike
Bass, Large-mouth	Dace, Horned	Pike Perch
Bass, Small-mouth	Goldfish	Sucker, White
Bullhead	Muskellunge	Trout, Brook
Bluegill	Perch, Yellow	Whitefish
Carp	Pickerel	

If you will look at the formulae, you will see that there are definite resemblances and differences. Some, for example, show the presence of spines in the dorsal while others do not. In the list of fishes there are some that are basses or bass-like. You will find that the formulae show some with anal fins wholly of soft rays, while others show the presence of spines in the anal fins. If you know anything about fish relationships, and try to put together those that are closely related, you will find that there is usually a close similarity in the fin formulae. A glance at a fin formula then might easily show you relationships and a closer examination would disclose essential differences. You may take these suggestions for what they may be worth.

To help you unscramble this chowder, let me say that the order in which the fin formulae are listed is the reverse order of that in which the fish are listed. That is the first fin formula fits the last named fish. To help further, let me suggest that the bluegill, crappie and large-mouth and small-mouth are all basses. Notice how similar their formulae are.

We hope that, with this help, you will not be disturbed now if in a book you see a fin formula given, but will be able automatically to read into the figures some picture of the fish. I find it difficult to understand why, when I have used fin formulae so frequently through the years, I failed to use them in my *Fieldbook of Natural History*. Had I done so I am sure the material there included would have been much more useful.

It may pay you, if you are a fisherman, to jot down in some handy notebook the formulae for the fins of the kinds of fishes you are likely to catch so that you may be prepared to defend an identification you may make in the field. Of course, you must remember that there are distinguishing characters other than fin formulae, and one of these we will now discuss.

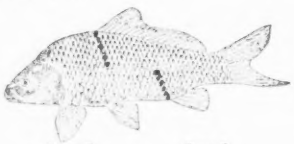
Scale Formulae

There are many kinds of scaled animals of course. We have scales on fishes, on reptiles and even on the legs of a bird. In many cases, the number and arrangement of these scales are relatively constant among members of a species, or of closely related species. True, there are usually some variations, but there are also limits beyond which these variations do not occur.

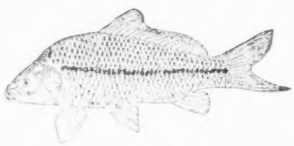
We cannot here consider the scales of the reptiles because it would involve too detailed naming of structures that, to many readers, might not seem significant. It is hoped, however, that the study of fish scales may be sufficiently interesting to induce many to carry their observations on to the scales found on members of other groups.

Frequently in literature, we may find a statement such as this: Scales 5 or 6- 35 to 37- 5 or 6. This happens to be the scale formula for the common carp. Offhand, to how many of you does this hold any significance whatever? Maybe you think it is of no importance, but if so I rather think you will change your mind.

Obviously, the formula given above may concern itself with three things. The 5 or 6 refers to one, the 35 to 37 to another, and the last 5 or 6 to the third. It should also be obvious that the middle of these refers to the series in which the scales are the most abundant. Naturally, this must refer to scales in a series running lengthwise of the fish and this is the case. The middle series in a scale formula refers to the number of scales in the lateral line, which runs down the sides of most fishes. To give you some idea of how this may be important to you, let me point out that the number of scales in the lateral line of a small mouth bass are usually from 72 to 78 while the corresponding number for a large mouth bass is 65 to 70. This bit of information, coupled with other you might get, may help you settle an argument about the kind of bass you may have. We may choose another example from the pike, pickerel, muskellunge group. In the pike, the number of scales in the lateral line is 123, or close to that number. In the muskellunge, it is approximately 150. Three of the commoner pickerels have different numbers. One of them, the common pickerel, *Esox reticulatus*, has 125 scales in its lateral line, or approximately the same number as that found in the pike but much less than that of the muskellunge. The banded pickerel, *Esox americanus*, has 105 scales, as does its close relative the grass pickerel, *Esox vermiculatus*. From this it may be seen that the number of scales in the lateral line may help in making some determinations but be less helpful in other cases.



5 or 6 5 or 6



35 to 37
European Carp
5 or 6 - 35 to 37 - 5 or 6

Now, what is the significance of the other series of scale numbers given in a scale formula? The first refers to the number of rows of scales between the lateral line and the base of the foremost ray in the foremost dorsal fin. This is determined by beginning with the scale at the front of the base of the dorsal and counting diagonally along the natural row of scales backward to the lateral line. The first scale reached in the lateral line is not counted. The sketch indicates how this line runs.

Let us see if we can find anything significant in this series of scales if we wish to distinguish a small-mouth bass from a large-mouth. In the small-mouth, there are eleven rows of scales between the lateral line and the base of the dorsal. In the large-mouth there are 7 rows. This, it would seem then, is a more dependable difference to note than we found in the scales in the lateral line. Besides, it is easier to count 7 rows of scales accurately than to count 70 scales in a long lateral line.

The third scale series refers to the number of rows of scales between the lateral line and the base of the anal fin. This number is obtained by counting the scales in a natural line forward and upward from the front of the anal fin to the lateral line. In our small-mouth bass, there are 25 such rows in this series while in the large-mouth there are 18. Frequently, the number of scales in the lateral line is the only figure quoted in a scale formula.

To know how the number of scales in a lateral line varies in different kinds of fishes, let me suggest that the common brook trout has as many as 230 scales in the lateral line, while the carp may have as few as 35. The scale formulae for these two common fishes are as

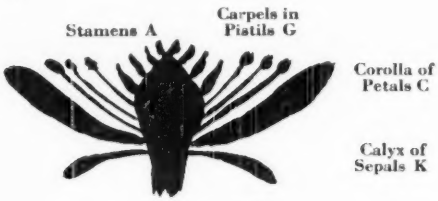
follows: Brook trout, 37- 230- 30. Carp, 5 or 6- 35 to 37- 5 or 6. Of course, the large scaled fishes have smaller numbers in their series and the smaller scaled species have larger numbers. Knowing this, a glance at a scale formula should help you immediately to get some picture of the general appearance of the fish under consideration.

Floral Formula

Those of us who may have been called upon to read critically the English offered in theses by many graduate students wonder if the elementary schools were wise in discarding the diagrams that many of us in our youth constructed in our work in grammar.

Just as there is some merit in the discarded diagramming of sentences, so there is a merit that is not always recognized these days in the making of floral formulae to bring out exactness of recording observations on floral structure. Let us, then, put a little time on this subject.

Even the most superficially trained educator probably recognizes the major parts of a flower of a flowering plant, or the sets into which the parts are divided. There is objective evidence that this is not always shared by some of the more highly placed, but that is another story.



Hypogynous Type

Ordinarily, we consider that a flower is typically composed of four sets of structures — the *calyx*, the *corolla*, the *stamens*, and the *pistils*, of which the first mentioned is the outermost or lowermost. The calyx, of course, is composed of sepals if it is represented. The corolla is composed of petals in spite of the logic of some standardized tests that have widest adoption. The stamens together make up what the botanists properly call the *androecium*, and the pistils or carpels, which are the parts of pistils, are referred to collectively as the *gynoecium*.

To write a formula for some specific flower, let us start with a common buttercup. In the buttercup, *Ranunculus acris*, for example, we have a flower in which the calyx is composed of five sepals, the corolla of five petals, the androecium of an indefinite number of stamens and the gynoecium of an indefinite number of carpels. We can reduce the few lines it took to say this by resorting to a formula like this: K 5, C 5, A^{∞}, G^{∞}. Since the words calyx and corolla in English begin with C, we use K for the calyx and C for the corolla, or at least for our purposes this should be ample explanation.

Having seen one formula, try to interpret this one: K 3, C 3, A 6, G $\widehat{3}$. Really, this refers to some lily in which there are three sepals, three petals, six stamens and, here is a new wrinkle, 3 carpels fastened together to make one pistil. One should notice in this formula, too, that the numbers of the parts in the sets are threes or multiples of that number. That suggests strongly to the botanist that the plant is a member of the group called the *monocotyledonae*. If the number were four or five, or multiples of those numbers, one might play a hunch that, like the buttercup, the plant belongs to the *dicotyledonae*. Remembering this, one can quickly glance at a mixture of floral formulae and form a reasonable judgment as to which represent monocotyledons and which dicotyledons. This idea reduces much information to a simple, relatively concise formula. To some this idea may be new and fine, and cause satisfaction, just as do a fine poem, picture, aria, or even an airplane high in the sky.

We have suggested in the last formula that we can indicate the joining of parts of a set by placing a curved line over the number indicating the parts joined. With this in mind, how would you interpret this formula: K $\widehat{5}$, C 3+2, A $\widehat{9}$+1, G 1? Obviously this is a dicotyledon because of the prevalence of the number 5, or at least the emphasis on it. The corolla must be composed of 5 petals, of which two are fastened together, as in the lip of a sweet pea. When we find that our pea has nine stamens fastened together and one remaining separate, and that the fruit is a one-carpel structure, we see what a typical pea formula may be. With that help, you should have become moderately literate, and should be able to read or write at least some of the simpler floral formulae.

Unfortunately, we cannot reduce all flowers to just these formulae. Let us take a petunia for example. Its formula reads something like this: K $\widehat{5}$, C $\widehat{5}$, A 5, G $\widehat{5}$. You have a hunch that it is a dicotyledon and know from the formula that the five sepals are fastened together, at least in part, that the five stamens are not fastened to each other, and that there is one pistil composed of five fused carpels. The new idea in this formula is that there is a joining of the corolla and the androecium. Look at your petunia and you will find that the stamens are fastened to the corolla as your formula suggested. With that information you should be able to interpret almost any floral formula, and to write a formula as well.

Before we get into further complications, there is one thing we should straighten out. You might find a formula in which the gynoecium was indicated as follows: G 2+2+2+2. This hypothetical formula would, of course, designate a flower in which there were four pistils, each of which was composed of two carpels. Then we might further complicate our story, as so far presented, by leaving out the parts of one or more sets. In this case, we of course indicate the fact by using a zero to indicate the number of parts. A zero would then appear after the letter A in a pistillate flower, and after the letter G in a staminate flower. A flower without petals (*apetalous*) would of course be indicated by a zero

after the C.

Practice in working with these formulae and in reading and in writing them, will help definitely in the understanding of many botanical terms that might in themselves be forbidding. Let us see how this would work.

We have already introduced the idea that we could use the term apetalous to mean without petals and have seen how this would appear in any formula. It is plain, then, what would be meant by the terms *polypetalous* and *gamopetalous*. The buttercup with its separate petals would be a good example of a polypetalous flower, and the petunia with its petals fused into a funnel-shaped corolla would be a gamopetalous flower. If you have an aversion to the use of names like these you might better read no further, or you may find yourself using intelligently words that heretofore may have been staggering. Sometimes, we find it possible to express the same idea in more than one way. We have already seen that we can indicate fused petals by a formula or by use of the word gamopetalous. We can also use the term *sympetalous* to indicate the same thing. I doubt if ordinarily synpetalous is used so frequently as gamopetalous. Similarly, for the term polypetalous, we have the term *choripetalous*, which means the same thing. With this as a start, you could write your own term for flowers in which the sepals were separate and for those in which these parts are united. To keep the record straight, those with separate sepals may be called polysepalous or *chorisepalous*, while those with united sepals would be gamosepalous or synsepalous. Do you not think that the formula is an easier way of expressing this idea than the learning of all these terms?

Top to bottom, Epipetalous type, Perigynous type, Epigynous type.

Of course, the botanists have appropriate terms to indicate the union of the different sets of parts of a flower. We started with the petunia, in which the stamens were grown fast to the corolla. Obviously, the simplest way to say this would be that the stamens are *epipetalous*. Since the stamens are really the only thing that could grow on the petals we can shorten our statement and merely say that the flower is epipetalous.

If we should have a union of the calyx, corolla and androecium, as we do in such common flowers as apple blossoms, it would be obvious that this means a union of parts around the gynoecium. What simpler way could we say this than to coin the word *perigynous*. Of course, botanists would have coined it before we did, but it may be helpful to try to make our own term and gratifying to find that others agree with us. If none of the parts were fused around the gynoecium, so that the gynoecium was clear and free above them or they beneath it, we would use the term hypogynous. If on the other hand, the four sets were united so that it appeared that the calyx, corolla, and androecium came off the top of the gynoecium, then we would have the term *epigynous*, which of course means as it should be on the gynoecium.

Botanists will differ as to the significance they give to the arrangement of flower parts, just as zoologists differ in their interpretation of the classification of animals. In general, however, it seems that most botanists have the idea that the monocotyledons are more primitive than the dicotyledons and should therefore be considered first. If, then, you are using Gray's manual and find a flower whose floral formula indicated parts of 3 in the sets, the chances are that the flower will be found considered early in the book. Those with parts in fours or five will be later. Similarly, it is conceived that the polypetalous idea is more primitive than the gamopetalous idea. As a result, in either the monocotyledons or the dicotyledons, the polypetalous flowers will be considered before the gamopetalous. That would mean that our petunia would be later in Gray than our rose or our buttercup.

So far as the fusion of sets are concerned botanists consider that the hypogynous character is more primitive than the perigynous character, and that the perigynous character is more primitive than the epigynous. Knowing this, and knowing the floral formula of a plant, you might play a rather safe hunch on where in Gray a given flower might be found. You see there is a system in all of this, orderliness can be observed in the arrangement of plants, that floral formula help bring out the essential differences and as such they have something in common with the poem that "hits the nail on the head," the song that makes the "hit parade," or the Shakespearean play that draws capacity houses in many countries and in many decades.

Fortunately for all of this, true perfection is elusive. A formula in physics that today is the gospel truth tomorrow may be so qualified with exceptions that it is practically meaningless. But the same holds with poetry, with art and with literature. The perfection we seek is always just beyond the immediate horizon. Sometimes it is a long way beyond that point and sometimes it is not even sought, but in the long run there is a satisfaction that goes with an attempted crystallization of many observations into a formula, a picture or a verse that is more than worth while. The point is that a good formula or a good bit of poetry or a fine bit of art or prose give us a starting point from which we may seek further improvement. The attainment of that vantage point gives satisfaction that may or may not have commercial value. Surely it has a strong personal value.

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Sport or Slaughter — Which?

AN EDITORIAL

"DESTROYING the life of a beautiful, useful, interesting wild flesh-and-blood creature, merely for the sake of an imagined pleasure, is morally wrong." This is the text that Devereux Butcher develops in the article on the pages immediately following this one. Some twelve million licensed gunners will differ violently with this thesis. An unknown number of other individuals who do not indulge in sport hunting for a multitude of reasons, but who do not care, one way or the other, will differ also. On the other hand, perhaps a majority of our citizens would agree with Mr. Butcher, particularly if they had given serious thought to the question.

Mr. Butcher, naturally, will be quickly classified by the gunners as a "crackpot." He will be given the benefit of a variety of adjectives, including bluenose, mollycoddle, prohibitionist, anti, and many others commonly found in articles in hunting and fishing magazines, and aimed at anyone who ventures to suggest that the gunner and his recreation are subject to question. Curiously enough, such adjectives are all defensive ones, reflecting a deep, but unadmitted, inner conviction on the part of the user that his activity *is* questionable.

Probably, also, we will be classed with Mr. Butcher, and his words quoted as our own. If this is the case — and it inevitably is — it will not worry us, but we would like, here, to express our own opinion.

Ideally, the taking of life just for the sheer pleasure of doing so is, unquestionably, morally wrong. With respect to his own kind, man has progressed to the point where he does not condone killing of human beings for fun, for target practice, or just because he does not like the way the target parts his hair. War, of course, provides the exception, and man still finds grim pleasure, in time of war, in picking off as many of the enemy of the moment as possible. At least some men do, while others find it a nauseating duty beyond which man should have progressed.

In the wild, conditions are a bit different. Many animals kill other animals for food. It is difficult, however, to prove that any species kills for the sheer pleasure of the kill, even though individuals — as with humans — may be killers with a strange, sadistic quirk. Predation in Nature, and occasional examples of killer instinct in the wild, are often cited by human gunners as evidence that "Nature is red in tooth and claw," and that man also is thus justified in being so. This is a plausible but unintelligent point of view. Man claims mental superiority that forbids such a stand.

So far as we are concerned, we are interested in the living forms of wildlife. We find pleasure in seeing them, learning their habits, appreciating them as a part of the whole fascinating mosaic of Nature. We think that a bloody and quite dead wood duck is a gruesome sight; that a limp and dead deer is a sad relic of a beautiful and vibrant animal, thrilling to observe as it bounds through its native forest. We have no interest in shooting any wild creatures for the pleasure of it, for we would be unable to experience any such pleasure.

However little we may be able to see in the blood sport of hunting, ourselves, we cannot escape the fact that a considerable body of upright and worthwhile citizens do find pleasure in it. To classify all such people as pariahs, moral lepers, killers, and such, would be as indefensible as it would be to classify as sportsmen the too many who find sheer delight in the quantity of the kill, regardless of law or decency.

Mr. Butcher makes the statement that "no individual with a real love for wild creatures could kill them for pleasure." There is a curious paradox in this conviction, perhaps best illustrated by such men as our own dentist. He is as fine, gentle and devout a man as we know. He loves his hunting dogs, and has been known to take his gun and accompany his dog afield. He is, we gather, not an expert shot, but has occasionally brought down a flying bird. In the process he has gone into the outdoors and there found relaxation. His impact upon the wild bird population is insignificant. To infer any moral obliquity on his part would be ridiculous.

On the other hand, we have a neighbor who, during the period of the early thirties, when our migratory waterfowl were at their lowest ebb, boasted that he did not care about the limit, because he "knew the wardens." To call him a rat would be to libel any rodent.

It would seem, therefore, that we must consider the question of sport shooting as regards individual hunters, with recognition of the fact that man has usurped a large percentage of wildlife habitat, thus making it necessary to control wildlife on the remaining habitat. And we must consider that a not unimportant percentage of those who find recreation in hunting those forms classed as game find equal joy in being outdoors, regardless of the bag. It may not be entirely comparable, but the average golfer would find a five-mile walk onerous, but a five-mile walk hitting a golf ball becomes a joy.

So, while we have no interest in killing any wild creature, we do believe a wild animal alive is far more interesting and attractive than a dead one. But we fear that man cannot reach the ideal of moral rectitude with respect to his attitude toward wild animals until he has progressed to the point of living beside his own kind without recourse to lethal weapons.

The Golden Rule for Wildlife

By DEVEREUX BUTCHER

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Devereux Butcher is executive Secretary of the National Parks Association and an ardent conservationist. He holds strong views about sport shooting, as will be discovered in the accompanying article. Whether his stated convictions are practical, in view of man's usurpation of habitat, or even in the best interests of those animals unfortunate enough to be classed as "game," is an open question. However, the moral implications of taking life for fun present issues worthy of thought, and we are happy to let Mr. Butcher express himself as he does here.

OBSERVATION and knowledge of wildlife have strong intellectual and emotional appeal. Through our national parks, state parks, wildlife sanctuaries and countless Nature programs, millions of people are discovering the pleasures gained by watching living creatures. Photographing wildlife is becoming enormously popular. More and more books and newspaper and magazine articles on Nature are available to the reading public. Yet this growing enthusiasm for wildlife faces decreasing opportunity for enjoyment due to competition with the forces of destruction. With more and more men and boys being lured into the gunning fraternity, it is plain to see that there is not enough wildlife to satisfy the growing demand. Ironically, by publicizing the imagined pleasures of the chase and the kill, the gunners are hastening the day when even they can no longer pursue their sport; and they are removing from the earth one of the great heritages that Nature has given to us.

Only in the national parks, national monuments, inviolate refuges, and in a few state parks and private sanctuaries can we be sure today of seeing our wild birds and mammals living undisturbed by man. But these reservations are neither large enough nor numerous enough to save from extinction some species now becoming rare. This is especially true of some of the larger mammals, such as bighorn sheep and caribou; and of migratory waterfowl, as certain ducks and geese. Among upland birds, sharptailed grouse and prairie chickens are perilously reduced. The whooping crane and band-tailed pigeon are rapidly disappearing. The Everglades kite is nearly gone, because ignorant gunners think it is a flesh-eating hawk, and most gunners shoot any hawk on sight.

Of course, man's use of the land — his communities, his sawmills, his farming, his highways — has destroyed much wildlife habitat. Add to this the pressure of an army of 12,000,000 hunters each year, and it becomes obvious that the drain of shooting for fun must be checked if we are to keep our wildlife. It is time, therefore, to weigh the moral aspects of pleasure killing.

One of our members, and a frequent contributor to the magazine — John Lindsay Blackford — offers a prize to be used for a conservation purpose. It seemed appropriate to use this in connection with Mr. Butcher's article. And it was felt that this, and other awards could best be used to stimulate thought about the subject as explored by Mr. Butcher, considered in the editorial on the page preceding this one, and touched upon briefly by Mr. Blackford on Page 149. Further details on that page, also.

Shooting wildlife for fun is needless slaughter. Hunters justify it as recreation. Yet, throughout the world, since the turn of the century, forty species have been wiped out. Needless extinction of a beautiful and valuable bird or mammal for recreation is downright tragedy.

The gunner considers wildlife a crop of which the surplus, he says, must be harvested. He places great emphasis upon the fact that man has upset the balance of Nature, and that therefore certain species have become too abundant for their food supply. These and other arguments are advanced to justify sport killing. Certain species, in some localities, do occasionally become too abundant for their range. This is most often true of deer and elk. Such over-populations must be controlled, but the killing need not be pleasure. Firing-line slaughter is not sport. Selective killing by skilled and informed men could

have beneficial effect by culling the poorer individuals, leaving the abler ones to perpetuate the species. This is the way Nature performs the task.

Wildlife shooting is not a spectator sport. Perhaps this is unfortunate, for otherwise it might well have been outlawed by public opinion. First-hand knowledge of the cruelty and brutality involved in wounded animals that escape, to say nothing of the destruction of animal life, do not come close enough to the majority of people to arouse opinion. Bull fighting, or cruel treatment of animals used in making moving pictures, are not tolerated by American public opinion, yet motion picture distributors handle films showing gunners in action. Public reaction is generally unfavorable, but the commentary is frequently worded to stimulate interest in pleasure killing. In some theaters these films are shown mainly on Fridays, when many children go to the movies.

Arms and ammunition makers are, of course, the foremost promoters of the idea that it is fun to kill wildlife. Through their advertising and "educational" propaganda they naturally seek to promote the sale of their products. Propaganda against the so-called predator species is presented to justify out-of-season shooting. Predators, of course, have economic importance, and some have even greater esthetic appeal than many non-predators. The gunner, the most avid predator on earth, regards many of these flesh-eaters as competitors, so joins in campaigns to kill the predators. Scientific studies of predators and predation prove the real value of these factors in maintaining Nature's balance, but prejudice, half-truths and selfishness are difficult to overcome.

"Would you say that it's the coyote or the wildcat that's caused game birds to disappear in this country?"

(REPRODUCED BY COURTESY OF CARTOON HUMOR, COPYRIGHT 1949 BY BETTER PUBLICATIONS, INC.)

The gun-makers' advertisements in national magazines are designed to attract new as well as old users of firearms, and to promote pleasure killing. The manufacturers are abetted by many other kinds of business that sell products used by hunters. The hardware merchants, who sells arms and ammunition, glamorizes sport shooting in autumn window displays. Opulent hunting and fishing magazines are full of articles that glamorize the sport. The state conservation commissions, supported largely by money from hunting licenses, publish magazines carrying many articles and pictures seeking to stimulate gunning. Some national magazines publish "timely" articles on the joys of the hunt. The resort owner advertises hunting, as do many state chambers of commerce and similar groups.

On the other hand, if wildlife were protected against the human predator, it would become so abundant that the tourist-travel promoters could invite everybody to come and see it. They would not then be limited to the comparatively small gunning fraternity during a brief "open season." The "pulling power" of wildlife for the general public is amply shown in certain national parks and sanctuaries. Wildlife watching is also big business, and would become vastly greater if given more encouragement.

Perhaps the most vicious of all methods of gun sales promotion is the gunning film disguised as "educational." One such film, entitled *The Making of a Shooter*, described in a news release from a wildlife organization, is an outstanding example:

"A full-color 16mm motion picture film 'The Making of a Shooter' which provides both entertainment and instruction is available to sportsmens' clubs, schools, and other interested groups for showing without charge. State game departments and such organizations as the Boy Scouts of America, the 4-H Clubs, and the National Safety Council are assisting in distribution of the film.

"This kodachrome film, produced by professional movie technicians, is released by the ..... as a part of its nation-wide campaign to promote the proper handling of firearms and to keep shooting a safe sport. Although this picture is primarily a safety film, it presents in a most effective manner the recreational appeal and character-building possibilities and other forms of shooting. It traces the development of a lovable youngster, under expert supervision, into a real sportsman with a full knowledge of how a gun should be handled safely and effectively."

The advertisement says "to promote the proper handling of firearms." Actually the film is designed to promote an ever-growing demand for guns and ammunition. Such phrases as "recreational appeal," "character-building possibilities of hunting" and "lovable youngster" are designed to help the film find ready acceptance by school people and other youth leaders.

Recently, public attention was drawn to another method of getting boys interested in wildlife killing. Certain state branches of the Izaak Walton League, normally one of the nation's best conservation organiza-

tions, have been rounding up under-privileged boys, carrying them into the country and teaching them to shoot wildlife.

Mr. Delos E. Culver, a League member, and active in humane and nature preservation work, wrote a letter expressing his opinion of this practice. He asked, "Why in Heaven's name do they have to be made into hunters?" And continuing, he says, "What little is left of the wildlife of America is vanishing unbelievably under the constant barrage of millions of guns. Is it necessary to do everything possible to accelerate this tempo of destruction by going out of our way to create thousands of new youthful killers. . .? Is teaching boys to pump hot lead into beautiful inoffensive creatures essential to good citizenship? Can't members see any attraction for children in the magnificent life of the outdoors without inculcating in them a desire to destroy it?. . . Why can't these boys be taken to the country and taught to love it and fight for its preservation without the slaughter element being injected? There are countless thousands of fine people in this country who regard the outdoors in such a light."

Walter Elwood, in his article, *Let's Build Good Citizens*, published in *Audubon Magazine* for September-October, 1944, says of the boy with a BB gun, "We must help him see that he is not being fair to bird or human neighbor if he shoots a downy whose presence may be enjoyed by others and whose existence as an insect eater is important."

On the matter of character-building, Mr. Elwood says, "When we help them to remember the rights of other people, and to see that the ignorant destruction of nature's gifts is unfair to their friends and neighbors, to their community and country, we are not only building character but nourishing the very roots of all conservation practice."

The effect that properly-trained youngsters have upon parents is sometimes profound. Says Mr. Elwood, "Defenseless parents are often taken roundly to task and made to mend their ways. . . Fathers fond of hunting have given up their pastime. . ."

I do not suppose for an instant that we can bring about a quick end to so-called "hunting." History is full of instances of resistance to better thinking and doing. I am certain, however, that crystallization of public thought in the matter will produce drastic and progressive improvement. It requires that all who dislike pleasure killing, or are alarmed at the rapid disappearance of wildlife, promote recognition of two basic principles:

1. Destroying the life of a beautiful, useful, interesting wild flesh-and-blood creature, merely for the sake of an imagined pleasure, is morally wrong.

2. In spite of laws, wardens and refuges, most species sought by gunners are declining and will become extinct, as many already have, unless present pressure for sport killing is reduced.

The great need is for a new attitude toward wildlife. We must realize that wild birds and mammals have the same right to life as we. The viewpoint that every creature, from a grouse to a moose, is useless unless it serves as a target, is depressing.

No individual with real love for wild creatures could kill them for pleasure. Everyone honest with himself would question the moral implications of sport killing. To teach a child that it is fun to kill wildlife is doubly wrong. There should be no pride in being called a "sportsman," as that word is applied to one who shoots wildlife for pleasure.

One need not destroy life to show how much of a man he is; nor carry a gun to put redder blood in the veins. Gun-toting and shooting is not a means for practicing "the virtues which should be at the core of every human being, such as fairness, justice, self-forgetfulness, patience, unselfishness, self-control, and self-restraint," as one gunner expressed it. Certainly there is nothing fair about the advantage a man with a high-powered rifle or shotgun has over a defenseless animal. It is neither just nor unselfish, and self-control and self-restraint have no part in this unequal contest. There are countless opportunities to practice and develop all the finest qualities in human nature without destroying the lives of wild birds and mammals.

We must stop teaching boys that hunting is a wholesome, manly sport, if we are to keep our wildlife. As for the practicing gunner, he will put aside his guns when and if he realizes community sentiment frowns upon sport shooting. Thus, stimulation of proper thinking in the community is a first step toward saving our wildlife and toward improving human morals.

It seems ironical that a mother who has taught her young son to be kind to animals, stands meekly by when, in following years, that same son goes forth, gun in hand, to wound or kill some beautiful flesh-and-blood

creature of the wild. I am sure most of us, as children, were taught to be kind to animals. Why, then, do many of us forget those childhood lessons and regard ourselves as heroes and red-blooded he-men when inflicting suffering and death upon wild creatures, not out of necessity, but for fun?

John Muir once wrote, "under proper training even the most savage boy will rise above the bloody flesh and sport business, the wild foundational animal dying out day by day, as divine, uplifting, transfiguring charity grows in. God-like sympathy grows and thrives and spreads far beyond the teachings of churches and schools, where too often the mean, blinding, loveless doctrine is taught that animals have neither mind nor soul, have no rights that we are bound to respect, and were made only for man, to be slaughtered or enslaved."

PRIZE CONTEST

Awards of $25, $10, and three of $5 will be made for the five best comments on the ideas presented in this article. In addition there will be ten honorable mention awards in the form of copies of "Exploring our National Parks and Monuments," and ten more subscribing memberships in the American Nature Association, including Nature Magazine. Comments must not exceed 300 words, or one typed page, double-spaced. The comments need not, necessarily, agree with Mr. Butcher, but will be considered for their thoughtfulness, clarity of expression and sincerity. They should be submitted before April 15, 1950. Statements should be sent to Editor, Nature Magazine, 1214 16th Street, N.W. Washington 6, D.C.

Most people have a natural sense of revulsion for the sight of agony and spilled blood. But a boy, accompanying his father on a hunting trip, soon becomes indifferent to the sight of suffering and blood. Let us begin now to teach our youngsters to feel sympathy and kindness toward all animals. Let us show them that every flesh and blood creature, like ourselves, is endowed with the instinct to stay alive; and that every creature, instinctively or otherwise, is struggling for peace and happiness. The world is full of pain and misery, and we should do all possible to reduce it. This is a great responsibility, an imperative duty; and it rests largely with those of us who are parents, educators and church leaders. We are truly humane and truly Christian if we practice the golden rule, not alone to our own kind, but to all the creatures with which we are sharing the earth.

Hunting and Wildlife Conservation

By J. L. BLACKFORD

The following statement by Mr. Blackford was a concise distillation of his own thoughts on the questions raised by Mr. Butcher but written before seeing a proof of the article.

THE biological communities within its borders are among the greatest ethical treasures any nation can possibly possess. They are beyond price; and all scientific knowledge and experience establishes the fact that their values can only be retained by a minimum of human disturbance. We are the trustees of marvelous life forms that required hundreds of millions of years to evolve, and that now present life at its highest apex in all this Earth's two billion or more years of history.

Hunting, as a skill of the true outdoorsman, may well continue to be a part of the American way of life, but only within the limits that scientific management of wildlife can maintain. It can be made a helpful part of wildlife control within civilized areas, but it can never be the prime objective of any truly scientific management of our wildlife resources.

Wildlife, including the larger "game" species, is not the property of any group, much less so when the result is its more or less systematic destruction; and when its irresponsible use entails the wanton and reckless killing of the many other species that uninformed prejudice of the moment may dictate. The outdoors should never be operated as an oversized game pen, a situation that, as every biologist knows, will, by its own unhealthy, artificial conditions result in failure, even for that very purpose for which it was so unwisely intended.

Present-day hunting, pressured and inspired by unchecked commercialism, puts a horde of so-called but misnamed sportsmen in the field, not only to ravage game species, but to destroy all forms of wildlife. Numbers of "sportsmen" blast every living thing they see, completely ignorant and heedless of the irreplaceable values they despoil. Promotion and support of such "sport" by selfish interests renews and multiplies another such generation that will hasten and complete the extinction of many more forms of wildlife, and thereby deny to others its priceless experiences.

Sportsmen are not a special race of he-men. Their present activities are an increasing stench to many who themselves bear that label today.

Belief in a Creator becomes meaningless if we wantonly destroy the matchless living examples of His handiwork. Extinction of species among the higher forms of life may well be the greatest of man's transgressions. Mankind's most realistic hope for progress and sanity is in a restored balance of and a close association with Nature.

Cathedrals of the Desert

By NELL MURBARGER

Photographs by the Author

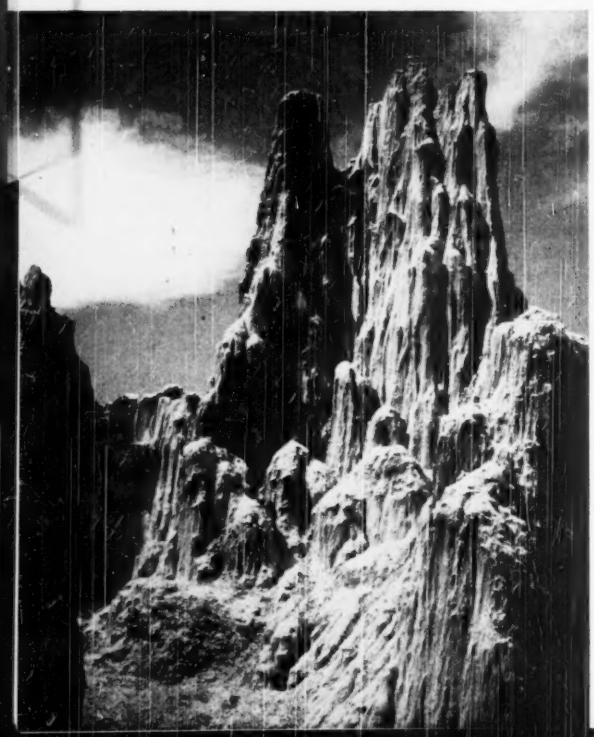
TUCKED away in the foothills of Nevada's Highland range lies a fantasy in stone; a medieval Bagdad lacking only the soft clop of camels' feet and the shouts of bazaar-bound traders to complete the illusory scene.

Here are gigantic pillars delicately etched into gleaming white towers as tall as the Taj Mahal. Here are temples in every shade of rose and buff, and mosques and minarets in soft gray. Immobile monks kneel in eternal prayer at the foot of mighty altars, and before the gates of battlemented castles are clustered knights in white armor.

Cathedral Gorge, as this amazing wasteland has been aptly named, is not, however, the handwork of human artisans but of erosion — that tireless sculptor responsible for so many wonders of the scenic West.

While Bryce and Zion Canyons, and the Grand Canyon of the Colorado River, are, likewise, products of erosion, geologists declare that the formation of Cathedral Gorge came about in a manner quite different from that of its famous neighbors.

Here, there was no madly-rushing torrent to gnaw away the canyon sides and leave exposed the bare skeleton of the earth. Instead, we are told, the present site of Cathedral Gorge was occupied by a large, stream-fed lake until possibly ten million years ago, when there occurred a terrific volcanic explosion from a center now unknown. Following the eruption, millions of tons of dust and ashes settled into the lake, filling it to great depth. Additional ash was carried there by the streams, and, eventually, the major portion of the water was literally crowded from its bed. An upthrust of the earth's surface completed the lake's annihilation.



Feeder streams and spring freshets continued to flow from the surrounding hillsides, but now they wandered willy-nilly across the fill, without regard to the original topography buried beneath 600 or 700 feet of accumulated sediment. As result, new canyons were carved, peninsulas were worn thin, and isolated islands and pinnacles came into being.

As Nevada's climate became arid, these tributary streams gradually disappeared, leaving their unfinished artistry to the skilled fingers of the desert wind.

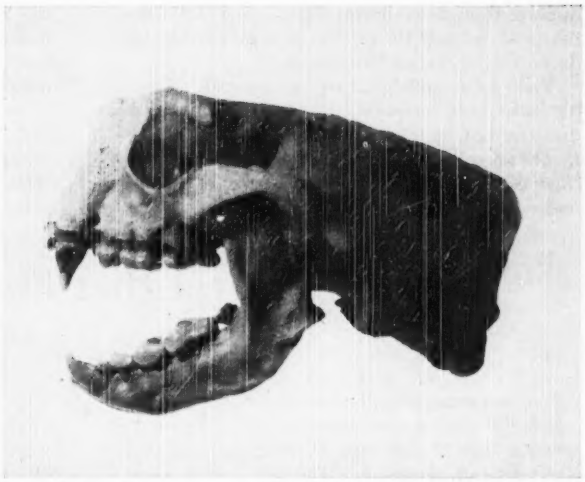
In the delicately-etched faces and stratified towers of Cathederal Gorge are visible today the culmination of this hundred-thousand centuries of effort by wind and water.

Since the earliest settlement of Nevada by white men, the gorge had served as a popular place for community outings and picnics, and in 1935 a 1500-acre tract in the heart of the scenic area was set aside for preservation as a State park. Since that time the road system has been improved, picnicking and overnight camping facilities have been installed, and a network of safe and scenic trails extended into every section of the gorge.

Situated midway between the cities of Las Vegas and Ely, the park is within two miles of U.S. Route 93, and is thus readily accessible to cross-country motorists. Easter sunrise services, held here annually for more than thirty years, are especially impressive when witnessed in this setting of desert quiet and mystery.

Reflections on the Skull of a Sea Otter

By VICTOR B. SCHEFFER

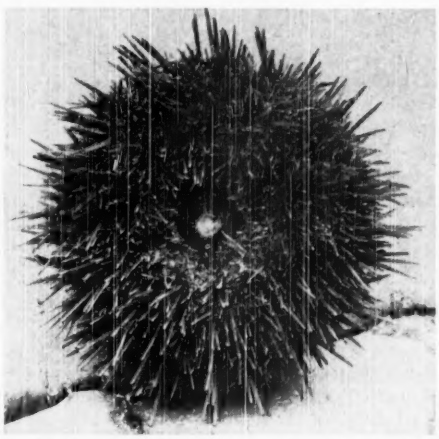


The skull of a sea otter, side view, showing powerful jaws.

TRAVELING for the Fish and Wildlife Service through the islands of western Alaska, I have, on several occasions, entered the haunts of the sea otter. That rare and little-known animal is now confined to Kamchatka, a portion of the Alaska coast, and a small strip of rugged shoreline along southern California. Returning recently from an expedition I brought with me the skulls of six sea otters whose bodies were found stranded on the beach of a remote Aleutian island. Thanks to the help of Elmer C. Hanson, an amateur student of Nature stationed at a nearby Army camp, these skulls were preserved for science. Foxes, sea gulls, and domestic rats had preceded me to the beach, and, by chewing and tearing, had ruined the priceless pelts of the otters. Later, in the laboratory, I cleaned the skulls for scientific study by boiling them in a dilute solution of ammonia.

Of the six skulls found on the beach, two were old, weatherbeaten and white. Four were fairly fresh. These displayed a strange purplish tint, like the color of a glass bottle long exposed to the glare of the desert sun. Even when boiled in ammonia the skulls retained their color. I do not recall having seen the skull of any other species of mammal that was any color but white, and I have handled hundreds of skulls.

The sea otter quite certainly derives this color from the sea urchins upon which it feeds. The Alaska sea urchin, *Strongylocentrotus drobachiensis*, is a member of the starfish family. It looks like a pin-cushion, is about the size of a baseball, and is covered with brittle green spines upon which it walks, stilt-like, over the floor of the sea. The urchin appears to be harsh and unpalatable; the last item that a mammal would willingly select as food. Yet this creature is known to compose about three-fourths of the diet of the sea otter. The otter dives to the ocean floor and rises to the surface with one or more urchins clasped in its paws. Then it proceeds to break the shell and to gulp down the slimy, orange-and-brown contents, swallowing many chalky spines and bits of shell in the process. In certain places along the Alaska reefs, sea urchins by the millions carpet the bottom with green.



An Alaska sea urchin, bottom or mouth view.

I once boiled a kettle of urchins in order to eliminate the spines — the first stage in converting the shells into Christmas-tree ornaments. I noticed that the original green color speedily disappeared and left the shells with the same purplish tint that is found in the bones of the sea otter.

Other shellfish, such as mussels, chitons, and crabs, fill out the diet of the sea otter. Second to the sea urchin in importance in western Alaska is the mussel. This mollusk is widely distributed along the rocky Aleutian Islands and in places attains a weight of two pounds.

Aside from the purple color, there are other noteworthy features of the skull of the sea otter. Most of them are related to the crunchy diet. The cheek teeth, for example, are exceptionally broad, strong, and well-rooted. Although the sea otter is a member of the weasel family, and is exclusively a flesh eater, the cheek teeth resemble at first glance those of an omnivore, for example, a human. The surface area of the molars is great as compared to the size of the mouth. The edges of the teeth are rounded and smooth for grinding, like a druggist's pestle. Deep pits tend to form on the working surface of the molars. Later,

some of them fill in through deposition of new dentine. There is certainly no question of a calcium deficiency in the diet of this shellfish epicure.

The canine teeth are long and pointed. They are probably used for prying shells from the submarine gardens, and, especially in males, for fighting.

The lower jaw is hinged to the cranium in such a way that the jaw can exert terrific pressure without being dislocated. In the cleaned skull of most other mammals, the lower jaw can easily be plucked away with the fingers. Not so with the sea otter. Here the hinge-groove, or fossa, is deep and overlapping, clasping firmly the condyle of the lower jaw.

Down the top of the skull and across its back there run keel-like ridges that anchor the powerful jaw muscles. These ridges (the sagittal and lamboidal crests) are nearly one-quarter of an inch high in old individuals.

The Squirrel that Flies and Buzzes

By W. L. McATEE

In December, 1609, the Earl of Southampton, member of the Virginia Company's Council, writing to the Earl of Salisbury, Secretary of State under King James I, remarked: "Talkinge with the King by chance I tould him of the Virginia squirills which they say will fly . . . and hee presently and very earnestly asked me if none of them was provided for him and whether your Lordship had none for him, sayinge that hee was sure you would gett him one of them. I would not have troubled you with this but that you know so well how he is affected to these toyes . . ."

With some grounds, this King aspired to literary fame and that great model of English prose, the King James *Bible*, was prepared in his reign, but he wanted a flying squirrel. And well he might, for with kings as with the rest of us, it is often the small things that seem important and must come right to keep us in a good mood. The historically (and deservedly) best known of his Virginia subjects, Captain John Smith, in his book of 1612 entitled "A Map of Virginia, With a Description of the Country . . ." noted, "A small beast they haue, they call Assapanick, but we call them flying squirrels, because spreading their legs and so stretching the largenesse of their skins that they haue bin seene to fly 30 or 40 yards."

That was good observation, for this squirrel glides rather than flies, using that term the way we do with respect to bats and birds. Its volplaning, its soft fur and large, lustrous eyes, and its general habits have been well enough described by various authors but little apparently has been recorded about its tendency to share the habitations of man. I have visited a home where flying squirrels were regular lodgers and have been landlord myself, where these beasties took over the attic, so perhaps can add something to the lore of the species.

Besides being very attractive in appearance and pleasant to the touch, the flying squirrel is confiding and readily tamable. In fact at a house where I sometimes called in Bloomington, Indiana, the great tameness of the squirrels contributed to their mortality. One did not have to be a member of the family to receive their attentions. No, they clambered over everybody at an evening gathering, explored pockets for tidbits, and freely permitted caressing. So unwary were they, that the usual flying-squirrel end was being crushed underfoot or under the rocker of a chair by those who would not have hurt one of the little animals for the world. Such events were always sad ones, but perhaps they were needed to keep the squirrel population down to reasonable numbers. At proper hours there seemed always to be a half-dozen or so of them scurrying about the living room.

With flying squirrels having the run of my own attic in Arlington County, Virginia, the animals proved objectionable in only one way. That was in drowning themselves in a water tank before it was screened to protect both them and the water supply. I became an expert in detecting by taste when it was necessary to remove another flying squirrel from this watery trap. Seldom did they try their teeth on anything forbidden — a greasy spot on a piece of clothing might prove an exception. And their exploring and gliding about neither made, nor was accompanied by, any objectionable sounds. There was some stamping of feet and another bit of squirrel telegraphy, which, fortunately, was seen as well as heard. That sound was not entirely unlike the crepitation of a rattlesnake. In fact the first comparison that occurred to me was to the rattling produced by the vibrating tail of certain non-poisonous snakes when the surroundings afford a dead leaf or other resonant object upon which the tail can play. Opening a door one night and turning on an electric light, I caught one of the little drummers in the act. Sitting near a board standing on edge, he held close to it a rapidly vibrating fore paw, which, striking the board, made an almost buzzing sound. Trial of one's own person shows that a far more rapid movement can be made by simply loosing a hand or finger to do its part reflexly than can be accomplished by wholly voluntary action. So the squirrel by nature knew, or by practice had learned, and neatly buzzed, apparently as message or response to a fellow or fellows nearby.

If King James had known that a flying squirrel can buzz as well as fly, it might have gone hard with a noble Earl or so if they did not get one for him.

Florence Merriam Bailey: Friend of Birds

By PAUL H. OEHSER

WRITING in the January-February, 1949, issue of *Audubon Magazine* — the golden anniversary number — Dr. Robert Cushman Murphy made a little slip that has evoked these few paragraphs concerning a great American bird-woman — the first woman, by the way, ever to be elected a Fellow of the American Ornithologists' Union. One of the contributors to the first number of *Bird-Lore* in 1899, said Dr. Murphy, "was Florence A. Merriam, subsequently to become Mrs. William L. Bailey and the author of *Handbook of Birds of the Western United States*." He meant, of course, that she later became the wife of Vernon Bailey, the naturalist.

Mrs. Bailey died in Washington, D. C., on September 22, 1948, at the age of eighty-five. After her husband's death, in 1942, she had kept on at the Bailey home, although poor health confined her to close retirement. In the last years she saw few of her old friends, and her death must have passed unnoted by many of her admirers of long ago.

Florence Merriam Bailey was one of the most literary of ornithologists. She combined an intense love of birds, and remarkable powers of observation, with a fine talent for writing, especially in those four books that she wrote as a young woman. The first one of these — *Birds Through an Opera Glass* (1889) — grew out of her youthful bird-watching days at Locust Grove, N. Y., where she was born and raised, and at Northampton, Massachusetts, where she attended Smith College. It is a book for the amateur, simply and engagingly written, but showing that the young author looked at her birds with a scientist's eye. She proved herself to be a superb bird-watcher, with a passion for exact observation.

Six years later Houghton, Mifflin & Company published Miss Merriam's next little book. She had developed tuberculosis and had been sent West to regain her health. But she did not remain idle, and we find her experiences recorded in *My Summer in a Mormon Village* (1895). Two other volumes soon followed — *A-birding on a Bronco* (1896), derived from her stay in southern California, and *Birds of Village and Field* (1898), which was a book for beginners in ornithology and one of the first popular American bird guides. It contained simple field color keys for identifying the birds, and more than 200 drawings by Ernest Thompson Seton (who then called himself Seton Thompson), Louis Agassiz Fuertes, and John L. Ridgway.

In 1936 the picture above carried Christmas and New Year's wishes to the Oehsers from Florence Merriam Bailey "and the three little red foxes."

The kind of writing that these books represent is to be found among a group that included, among others, such writers as Bradford Torrey, Frank Bolles, Olive Thorne Miller, John Muir, and John Burroughs. Florence Merriam was not the least of this group, but she was a cobbler who stuck to her last — her devotion was to birds. If she expatiated on mountain scenery, forest shadows, or the beauties of some western valley it was to furnish a natural background for her beloved avian companions. The only exception is *My Summer in a Mormon Village*, which, although it does not exclude the birds, is concerned chiefly with the people and customs of the little Utah town where she was staying. There are chapters on horseback riding, Great Salt Lake, and the doctrines of the Latter-Day Saints. In the Library of Congress this book, rather oddly, is classified under local history.

Miss Merriam's stays in the West had naturally made her familiar with the western birds, and in 1902 her *Handbook of Birds of the Western United States* was published, a rather remarkable achievement for a young woman of that day. It was, in effect, a companion volume to Chapman's earlier handbook covering birds of eastern North America, and in various editions it has remained a standard manual for nearly half a century, serving amateur and professional bird students.

In the meantime Florence Merriam had met Vernon Bailey, the energetic young field naturalist of the United States Biological Survey, which her brother C. Hart Merriam had helped to found and of which he was then chief. The couple were married on December 16, 1899, and since Washington was Vernon's headquarters they began building their home there.

No one who ever visited that home in the old days will forget it; for it was the home of two devoted naturalists — devoted to Nature and to each other — and every room, every nook and corner, was a testimonial to that devotion — the inviting library and living room on the second floor filled with books and pictures, with warmth and welcome: the octagonal dining room; the fireplaces; the American Indian rugs and baskets the Baileys had collected; Vernon's mammals and humane traps in the basement; the backyard, with its oaks and squirrels and birds (but no cats!). It was a place where many kindred souls foregathered, and to mention all their names would seem like calling the roll of American naturalists of that period.

It was said that the house was built around the tiger portrait on the panel of the library fireplace. It was painted by the wildlife muralist Charles R. Knight after a fine Bengal tiger then living in the National Zoological Park. "I remember," Mr. Knight recently wrote me, "both Vernon and Florence saying that they had built their house around the tiger picture, which I had promised to do for them before the place was actually constructed. The panel seemed always to give these two splendid friends the greatest amount of satisfaction, and I am wondering what will become of it now that they are gone." The artist will be glad to know that, in her will, Mrs. Bailey bequeathed this highly prized picture to the Smithsonian Institution.

In the summer of 1928, during one of Vernon's western field trips, Mrs. Oehser and I were Mrs. Bailey's house guests for several delightful weeks. At that time I was Mr. William H. Cheesman's editorial assistant at the Biological Survey, then in the Department of Agriculture, and during that summer we were working at the task of editing, proofreading, and seeing through the press Mrs. Bailey's *Birds of New Mexico*, and I shall always be grateful for the small part I had in the consummation of that rather monumental volume, and, through it, in knowing and working with Florence Merriam Bailey. Later, when I became editor of the United States National Museum and had to engineer the editing and publishing of other bird books, such as Bent's *Life Histories*, my experience with *Birds of New Mexico* proved invaluable.

The Baileys loved the Southwest, and *Birds of New Mexico* and Vernon's *Mammals of New Mexico* (1931) were the culmination of their natural-history work in that region. They covered the State on many field trips together. One of Vernon's collecting companions in the season of 1908 was a young man by the name of Clarence Birdseye, whom today we know as the originator of frozen foods. The Baileys covered, also, California, Arizona, and later the Dakotas. Mrs. Bailey "wrote up" her ornithological observations on all these trips, and they appeared in a long succession of papers in *The Condor*, *The Auk*, and *Bird-Lore*. If collected, these articles would make an impressive volume — and a readable one, too.

Birds of New Mexico was her magnum opus, and in 1931 this book — published three years before by the New Mexico Department of Game and Fish — won her the Brewster Medal of the American Ornithologists' Union. It was the first comprehensive report on the bird life of the Southwest. Illustrated with some of Major Allan Brooks's most felicitous color work, it combined technical descriptions with the author's own inimitable ornithological reporting.

I do not know that Mrs. Bailey ever described a new species or subspecies of bird; her concern with classification was only as a means to an end — the end being to familiarize others in an orderly and interesting way with the charm of wild birds and their ways. She was the keenest of observers, and she was able to describe what she saw and heard in words and phrases as sprightly and graceful as the birds themselves. Furthermore, she possessed a remarkable awareness of the unity of Nature, and a sensitiveness to Nature's myriad ramifications. These things, too, she was able to impart to her readers. Her last book, *Among the Birds in the Grand Canyon Country*, published by the National Park Service, appeared in 1939, when she was past seventy-five years.

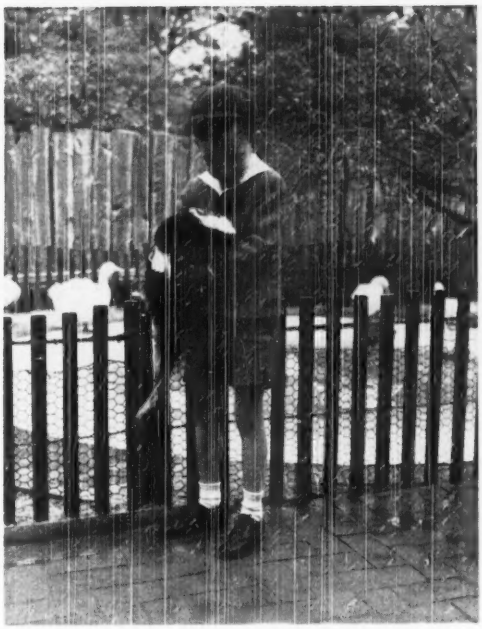
The companionship that existed between Florence and Vernon Bailey was something to be more than admired. It was a unique relationship that extended far beyond the intimacies of their daily living. As Howard Zahniser has written: "The reassuring and enriching influences of this companionship have a precious reality for many who must now only remember it, but the remembrance is enduring and is most fittingly treasured up in the writings in collaboration that were among its benefits." Two works in which the Baileys thus collaborated were *Wild Animals of Glacier National Park* (1918) and *Cave Life of Kentucky* (1933).

Mrs. Bailey possessed a gentle and lovable nature. Her love for birds and animals did not preclude her devotion to people and causes. She was active in educational, child-welfare, and other affairs of her community. The local Audubon Society and its programs took much of her time. She loved all wholesome things and wholesome living; she hated all forms of cruelty and was uncharitable toward many of the degrading influences of modern life. She held tenaciously to principles and ideas, first because of her convictions and then because she required a well-ordered life if she was to accomplish all that she felt she should. She did accomplish a great deal in the generous span of her life. Two traits of her character shine forth from her brief account in *Who's Who in America:* modesty with regard to her own work and pride in her famous older brother. She was content to be listed as "interested in ornithology" and as the "sister of Clinton Hart Merriam."

A Zoo within A Zoo

By GRACE V. SHARRITT

Photograph from N. Y. Zoological Society



A young visitor to the Children's Zoo at the Bronx Zoological Park falls in love with Petunia, the Skunk, and would take her home if he could.

At the Bronx Zoo, New York, where each year the visitors number in the millions, there is another zoo, no less popular in attendance. However, to be able even to get inside this inner zoo's Mother Goose and Fairyland exhibits, an adult must be accompanied by a child. In fact, most smart children park their parents at the Zoo Bar, a resplendent luncheon place where the "old folks" can drink coffee or lemonade and chat about the weather, while the kids are free to visit all the wonders of their own special zoo by themselves.

Among the chief characters at the Children's Zoo is Petunia, the fragrant skunk. Petunia, of course, is de-skunked! Then there is Deacon, the talking crow! Deacon's vocabulary is rather limited but he is always there to greet the visitors with a cheery, "Hallo! Hallo!" Many a child has learned to talk "crow" from their beloved Deacon!

Children's Zoo is eight years old, and there has been many a turn-over in "pets" during that period. Take the Guinea Pig Family, for instance! It seems that they are forever patronizing the Blessed Event House! One of the biggest problems at the zoo is keeping a supply of small pigs in the Piglets' House. They grow so fast!

The Play-Ring, social center of the Children's Zoo, is where boy and girl meets Kilroy, the Llama, the Hare and the Tortoise, and Baa-Baa Black Sheep. Besides other notable birds and beasts, which helped to entertain more than 350,000 youngsters last year, Noah's Ark and Mouseville rate tops for gleeful interest.

It is like a chapter out of *The Wizard of Oz*, or a juvenile Arabian Nights Entertainment. Children squeal with delight as they cuddle Petunia or talk to Deacon. They laugh at the antics of baby pigs and are entranced with the squabbling of barnyard ducks and geese.

Lee Crandall, general curator of the New York Zoological Park, however, takes care that none of the birds or beasts become over-tired from too much eager visitor-attention. "It keeps every bird, beast and attendant," says Mr. Crandall, "on their claws, paws or feet to entertain so many enthusiastic youngsters. But we run them in relays so that no animal or human ever gets exhausted by childish affection."

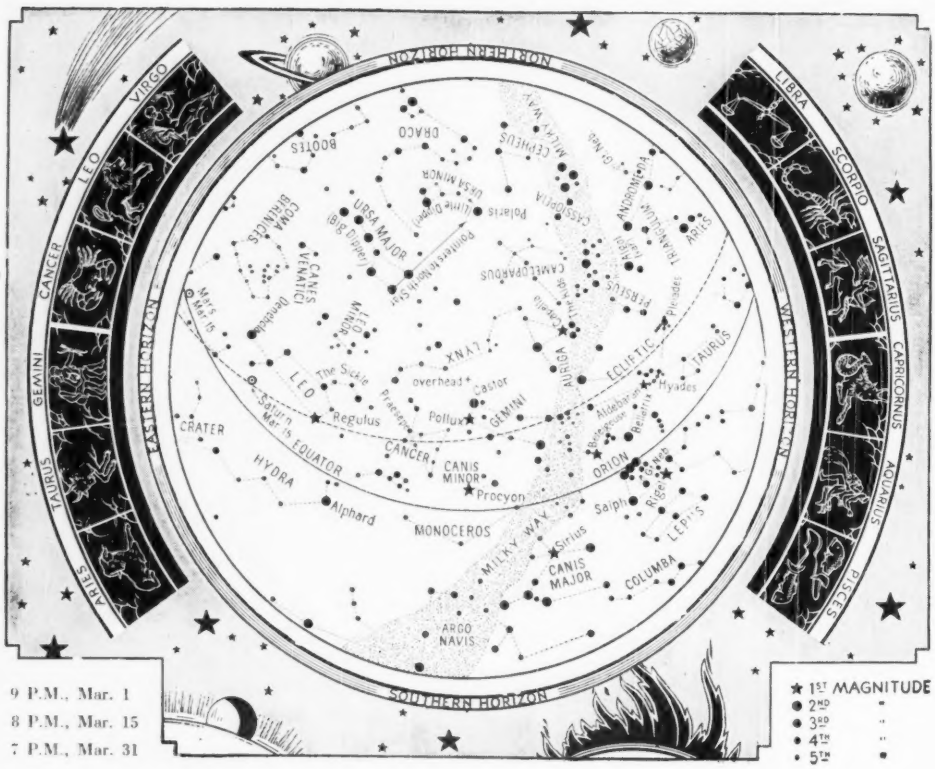
As in the past, grown-ups are tolerated at the Children's Zoo but their attendance is not encouraged. However, some Mom or Dad is always trying to sneak in under the sheepish pretext that she or he is still a kid

*

Light of Sunset

By ALLEN E. WOODALL

The light of sunset fell across the houses,
A rosy blessing from the mountainous cloud.
And suddenly all the city was beautiful,
And in the stillness a meadowlark sang loud
And clear as an evening bell, not far away
I heard the steps and hands of dark-eyed evening
Fumbling a moment at the door of the day.



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

Mars Nearer the Earth

By ISABEL M. LEWIS

On March 27 the planet Mars will come within about 60,400,000 miles of the earth. The date of opposition, at which time the sun, earth and Mars are in line, with the earth between the sun and Mars, is March 23. The planet will then be above the horizon from sunset to sunrise and on the meridian at midnight. Although at this time Mars will be about 3,000,000 miles closer to the earth than it was at the last time of closest approach, which occurred on February 17, 1948, the present opposition is not one of the favorable ones. If the orbits of the planets were circular there would be no difference in the distance of Mars from the earth at each opposition. It is due to the elliptical shape of both orbits that the distance between the planets varies considerably at different oppositions, depending upon what parts of their orbits they are in at such times. Thus are heavenly movements governed.

In a period of fifteen or seventeen years the distance of Mars from the earth at time of nearest approach, which occurs within a few days of the date of opposition, goes through a complete cycle of change. In the year 1939, on July 27, Mars came within 36,000,000 miles of the earth. This was one of the most favorable oppositions, although not as favorable as the opposition of August, 1924, when Mars came within 34,500,000 miles of the earth, the closest it can possibly come. The planet then appeared so brilliant that, for a brief period, the only planet that outshone it was Venus. At the opposition of October, 1941, the distance of Mars from the earth was about 38,000,000 miles. In November, 1943, it was about 50,000,000; in January, 1946, the distance was 59,500,000 miles; in February, 1948, it was 63,000,000 miles; and in March of this year, 60,400,000 miles. At the next opposition, in May, 1952,

it will be about 51,900,000 miles. The next most favorable opposition will not occur until the year 1956, when Mars will again come within about 35,000,000 miles of the earth. The interval between successive oppositions of Mars is, on the average, about two years and two months. The relative positions of the earth and Mars in their orbits vary in such a way that the most unfavorable opposition, when the planet is at its greatest opposition distance of 63,000,000 miles, occurs in the month of February. The most favorable opposition, when it is about 35,000,000 miles from the earth, occurs in August.

Although this is not one of the favorable oppositions of Mars, much attention will be given to the planet at this time. New methods of approach to the problem may reveal new facts regarding the atmosphere of the planet; the nature of the green areas on its surface, which show seasonal changes; the great, reddish-ochre desert regions, which give to the planet its pronounced reddish color. It has generally been believed that the green areas represented some low form of vegetational growth, and that the desert areas are reddish because of the presence of reddish iron oxides in great abundance.

Dr. Gerard P. Kuiper, of the Yerkes Observatory, writing in "The Atmospheres of the Earth and Planets," gives reasons for believing that the desert regions of Mars are composed of igneous rock similar to felsite, and recognizes the possibility that the green areas on Mars are covered with lichens, which are the hardiest terrestrial plant life. He sees, also, the possibility that different forms of plant life from those known on our planet may have developed under the very different conditions that must exist on that planet. These are produced by the scarcity of oxygen in the atmosphere, the great diurnal changes in temperature, even in equatorial regions, periods of severe drought in the Martian summer, and probably great exposure of the surface to ultra-violet light because of the greater penetrability of its atmosphere by the sun's radiations. The polar caps are considered almost certainly to be composed of frost at a temperature much below 0 degrees Centigrade.

The clouds and haze, so conspicuously visible in the atmosphere of Mars, consist of ice crystals, the clouds resembling the light cirrus clouds of our own atmosphere. The Martian haze is present in the atmosphere in greater or less quantities at all times, and may serve, especially if it gets particularly dense at night, to retard outgoing radiations from the planet's surface and produce a blanketing effect when most needed. It is possible that water in the liquid form is extremely scarce or non-existent on Mars. Many remarkable discoveries are now being made regarding the nature of our own atmosphere through new methods of research, including sending rockets and balloons to great heights, and some of these discoveries may shed light on problems connected with observed phenomena in the atmosphere and on the surface of Mars. It is hoped that the great, 200-inch telescope on Palomar will be turned toward our small but fascinating next-door neighbor in the solar system at the present opposition. The results of the penetration of the Martian atmosphere with the aid of this greatest of all light-gathering instruments would be of exceptional interest and value.

As Mars will be on the celestial equator about this time it may be seen to equal advantage from both northern and southern hemispheres. At some oppositions, when the planet is farthest north or south of the equator, it is observed to much better advantage in one hemisphere than in the other. Northern observers have the advantage when the planet is farthest north of the equator, and southern observers when it is farthest south. During the present opposition the planet will be equally well observed in the two months of March and April, since the date of nearest approach is so late in March. At the beginning of March Mars surpasses all stars in brightness except Canopus and Sirius. By March 10 Mars is exactly equal to Canopus in brightness, but in a few days it becomes somewhat brighter than Canopus and remains so until early in April, when, from the 7th to 11th, it once more equals Canopus in brilliancy. After that it decreases in brightness, slowly at first, until by the end of that month it is slightly less brilliant than it was at the beginning of March. Throughout the two months of March and April, then, the planet will be seen to the best advantage, being surpassed in brightness at all times during that period by the planets Venus and Jupiter, now in the morning sky, and the brightest of the stars, Sirius. During March, Mars will be found in the constellation of Virgo, and there will be no difficulty in recognizing it, both because of its unusual brightness and its ruddy color.

This month there will be an annular eclipse of the sun, which will be visible on March 13 in the South Atlantic, Antarctica, including the south pole, the extreme southern part of South America and the southern part of Africa. This is an unusual eclipse for the reason that the path within which the annular phase is visible is partly on and partly off the (Continued on page 163)

The Senders

By RAY ROMINE

A clear March night, and to me every star
Is speaking in its quiet, winking way.
The gates of Heaven have been left ajar
So each bright smiler might come out to play.
Resplendent, yes, but futile — is it like
The One who planned this universe to fail
To find a purpose for their nightly hike;
To let them blink like that to no avail?
I cannot quite believe it, so I cast
About the sparkled meadow of the sky,
Convinced there is an answer; and, at last,
My patience is rewarded for its try:
They're living dots and dashes, swift-sent Morse
To tell me that the spring is here — of course!

The School Page

By E. LAURENCE PALMER

Professor of Nature and Science Education, Cornell University, and Director of Nature Education, The American Nature Association

PERCENTAGES

This month's special insert deals with formulae and symbols, the appreciation of which may find a ready place in the activities of any schoolroom. Some of these are exact; others, approximations. All, however, help in defining general observations. The degree to which they may be accepted may well be determined by practice.

We give a table showing the dentition of certain mammals. It must be remembered, from our earlier insert on age, that the number and nature of teeth vary with age, sex and other factors so we cannot arbitrarily accept a dental formula as final. It is good experience for children to learn to qualify what they are told, or what they may think is final. Only the exuberant salesman can tell you that his product is 110 percent perfect and get away with it. In science, we know that 100 percent perfection is most unusual, particularly in the so-called less exact sciences. Even the perfection taught me in physics in college is now so faulty that the most significant developments of the century are coming from the exceptions to the old rules.

Children in the lower grades can make a beginning in understanding some of the formulae suggested in the insert. Most schoolrooms have access to a goldfish. Its fins are large and conspicuous. Even alive and swimming free, some of the qualities used in making fin formulae may be observed in it. If a variety of fishes are available for observation the making of fin formulae may provide much fun and instruction. But even then there will come times when it is difficult to make a final decision. Some fin rays seem to be spiny or merely simple, soft, unbranched rays. Into which category should they be placed? These are some of the questions that will have to be faced if the making of fin formulae is followed up. However, they are worth while; not 100 percent dependable but significant.

The same holds with scale formulae in fishes. The formulae found in books and elsewhere are suggestive. They usually give the variations, and if the specimen being examined offers characters within the limits of these variations the record is significant. With our track formulae, we have equally variable characters. In fact, they are even more variable because tracks in snow, for example, may vary greatly with their age, due to melting, drifting in of snow, freezing, or other factors. One must get experience with these variations and decide for himself the percentage of dependability that is to be expected of a formula.

Floral formulae, of course, are the merest approximations. Individual flowers of a species may show considerable variation, particularly if they are under cultivation. But while we get these variations we also get certain constants, and these, if reached through experience with individuals, may be worth knowing.

As a matter of fact, most of our experiences, in school and out, may be evaluated in percentages if one wishes. At the field trip of the American Nature Study Society at Jones Beach, New York, some ninety persons spent a whole day studying Nature in general. Mr. Teale, Mr. Peterson and Mr. Pough had promised that we would see a snowy owl. We saw quite a few, but I doubt if there is a person in the group who will ever forget one that flew in a wide arc over our heads. The white owl, the clear blue sky back of it and the general setting were perfect. Pough, Peterson, Teale and Company had delivered the goods. The trip, for most of us, became 100 percent perfect with the flight of that owl. Anything extra, such as finding from the owl's pellets that it had been eating birds, or the finding of trails and tracks of mice that it might have eaten, were just extras. Even the observations on clam shells that, in all probability, had been dropped back from the shore by gulls could hardly be figured into the percentage of success of that trip.

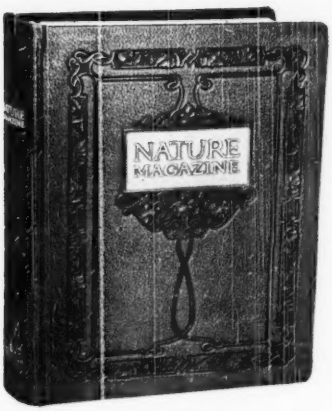
Some teachers figure that field trips are not worth while because they are expensive in time, difficult in matters of discipline, and just not orthodox. In all probability such teachers should not attempt trips. The percentage of success under such leadership might be low. But this does not mean that inexperienced teachers should not try trips. Who can measure in percentages the permanent or worthwhile effect of a real field experience? Those of us who like trips find values in them that are not recognized by others.

To many teachers, percentages are magic figures that measure accomplishment in many fields. To some, the figures are all that count. At the recent meetings in New York, I talked with one educator who has published repeatedly the percentages that he thinks he has found, but I know that much of the data he used were not valid. I supplied some of the data, told him it was not valid and yet he used it just the same. This man is percentage-mad. I am sorry for him.

Another man with whom I had a number of interesting conversations at the meetings, from which I have just returned, repeatedly used the term percentage during our talks. He is a high officer in a major professional organization interested in the teaching field. We talked on matters in which I knew we must be agreed, and he admitted that I was right, but said he could not go along with me because there was "no percentage" in it for him. The question that arose in my mind was whether there really was any percentage in agreeing with ideas that you knew were wrong. Is there merit in being identified with a small percentage that your intelligence tells you is right, or greater merit in being identified with those that are wrong simply because there happen to be more in that camp? Percentages may be really dangerous. A high percentage of agreement with something that is wrong may be less creditable than being in the disagreeing minority. It is possible that on this rock democracy may have difficulty in surviving since majorities rule.

The degree to which you rely on percentages is up to you. You know of students who can get high grades but who lack the abilities of those who are unable to attain similar ratings. I met a man at the meetings who, as a former student of mine, demonstrated a remarkable ability to get grades. He told me that he had recently finished tops in a competitive examination for an administrative position. I immediately offered up a silent prayer that some authority might be able to evaluate the evaluations that had already been made. What percentage of the percentage given was worthwhile?

Probably in all of these matters there is a middle of the road path that leads to happiness. We all have to decide where we will be happy, I suppose, and find our life along that route. Once in a while we find those who "kick against the pricks," and whose concern with percentages so popular with others is negligible. They place self respect above agreement. I rather think they have something but I know that some of them are far from happy. Possibly the view of these ignorers of popular polls is best expressed by W. L. McAtee in his "The Way of One Biologist." He writes: "Many a time in my life I have fought the best I could for what I thought was right but it is not the way to 'get on.' The sycophants, back scratchers, and wire pullers get there, while the simple, blunt, and honest man is put in a corner, or worse. However, if one is built that way, he has to act so as to keep his self respect. What substitute the others have for that, I do not know." I enjoy reading this quotation of Dr. McAtee's from time to time. There are those who would not. I am sure he has not the slightest concern about the percentage that may agree with him. There are times when this view is most refreshing.



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Street

City and State

Playing in the East

Our Eastern Playgrounds. By Anthony F. Merrill. New York. 1950. Whittlesey House. 353 pages. Illustrated. $3.75.

If anyone is planning an outdoor holiday along the Eastern Seaboard he should be able to plan it with this book in hand. Here, between two covers, is a guide to park and forest playgrounds in the East, both those administered by the Federal Government and by the States. The author confines himself to the "developed" areas, although in many cases the development is rudimentary, and in others quite elaborate. He includes areas that should satisfy the whole gamut of recreational tastes, from those that want what is primarily wilderness, and wish to rough it, to those who must have as much of the comforts as the circumstances permit. With respect to each area the location is given, plus a description of its outstanding features and facilities. The arrangement of sections in the book is geographical, starting with Maine and ending with Florida. An excellent index provides quick reference to any specific place one may have in mind, or to which a friend may have recommended the prospective vacationer. This book is the only comprehensive guide to the publicly owned recreational areas in the East. Even for the individual States it goes beyond the information supplied by the State recreational or promotional agency, and is, fortunately, shorn of some of the adjectival superlatives often found in this

Frogs and Toads

Frogs and Toads. By Herbert S. Zim. New York. 1950. William Morrow and Co. Illustrated by Joy Buba. $2.00.

This is the sixth in a series of Morrow Junior Books in the natural science field by this author, who is a writer, scientist and teacher. It is the brief, popular story of our frogs and toads and their place in the outdoors. Space is about evenly divided between picture and text, which is set in large type.

Pacific Fishing

California Salt Water Fishing. By J. Charles Davis, 2nd. New York. 1950. A. S. Barnes and Company. 271 pages. Illustrated. $5.00.

This is a guide to fishing in the waters that lap the shores of California and lie off those shores. Starting with a general picture of California fishing, it proceeds to a description of the various game fish encountered, treats with tackle used, discusses surf fishing and big game fishing of the deeper waters. It is a book that seems to have overlooked nothing that properly comes within the scope of its title.

Exchange?

Elwyn Lewis, 384 E. Warren St., Flint, Michigan, collects and rears butterflies and moths as a hobby. He would like to get in touch with other collectors with a view to exchanging specimens.

Just Published

OUR EASTERN PLAYGROUNDS

By A. F. Merrill

FOR all who love being out of doors, here is a guide to the public-owned recreation areas of our eastern states. It lists, locates, and describes virtually every developed facility in the National Parks, National Forests, and the state parks of every seaboard state from Maine to Florida.

This book shows you in advance where you can picnic and swim, where you can hike in a few minutes for an interesting view, where you can find the best hunting and fishing, where you can and cannot camp, where there are special trailer facilities, etc. Each chapter includes a list of addresses where you may write for camp site reservations or to make special inquiries.

This book is of great value to the motorist. It is a simple, graphic guide, broken down state-by-state for easy reference. It contains illustrations, maps, and precise touring directions; everything you need to get away from the crowds and confusion and enjoy out-of-doors holidays that are informal and inexpensive.

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Camera Trails

By EDNA HOFFMAN EVANS

We photographers are an assorted lot — old ones, young ones, fat ones, thin ones, beginners, experienced ones — but most of us share at least one characteristic in common. We like to tinker and concoct new gadgets and devices to further our hobby.

The description of one such gadget, which should be helpful in taking bird nesting and other Nature pictures this spring, is relayed herein, just as its original author, Bob Corrigan of Smethport, Pa., wrote it. He queried me on the idea last fall and I suggested that he put it into about 500 words for the benefit of Camera Trailsmen.

Corrigan calls his gadget the "Smethport Standee, A Rigid Unipod." Here is how he describes it:

"Everybody knows that unsteadiness of the hand-held camera makes snapshots unreliable. You don't get a truly sharp negative with a longer exposure than 1/100 second." [Opinions on this differ. Some set the hand-held limit as slow as 1/25. Certainly, however, the slower the exposure time, the greater care must be taken to hold the camera motionless. Editor]

"Must you then take everything from a tripod which is a hampering piece of luggage on a holiday? In effect, yes. Practically, however, there is a way around it with the 'Smethport Standee' (named after a little town in Penn's Woods) which, being rigid, will serve for time exposures and, needing no complicated adjustments for use, will also serve as a walking stick for a hike.

"You can use a self-timer and get into your own pictures and you can check composition before exposing. Snapshooters usually don't.

"Here is how to make the standee for about a dime. Assemble: a straight round stick of hard wood (such as a broomstick) from 2½ to 3 feet long, as may suit you; a 3/16-inch stove bolt, tested to make sure the thread fits into the camera tripod-screw bushing; two nuts to fit the stove bolt; a pop bottle cap; leather from an old glove; the usual workshop tools and basic sewing kit.

"Put the stick into a vise and with brace and bit bore a transverse hole, ¼-inch in diameter, about three-quarters of the way through the top edge about one inch from the large end of the broomstick. This hole must be deep enough so that one of the nuts can center in it under the longitudinal bore you will make next.

"Now, with a 3/16-inch bit, bore down through the center of the stick into the first opening so that the axes of the two bores meet at a right angle.

"Shave down the other end of the stick to a long point. Remember that the object is to make it enter the ground easily. No stubby point will do.

"Next, test the stove bolt to see how many threads go fully into the corresponding recesses in the camera. Note also the number of threads taken up by one nut, since the second nut will go between the end of the unipod and the camera, locking the mechanism up.

"Hold the first nut flat inside and at the top of the transverse opening while you connect the bolt through the lengthwise bore from the end. Count the threads above the end of the unipod necessary to accommodate the other nut and the camera bushing (as determined above) and with a hacksaw cut off the head of the bolt at the height marked. File the butt

This is the Smethport Standee in operation. Jake Stryker took the picture.

smooth with a couple of strokes.

"Now thread the second nut on the stem of the bolt and screw it down to contact with the end of the standee. Test again on the camera and make any adjustment needed between the nuts to provide a perfectly snug fit on the bushing. Tamp a cork into the open hole, for looks, and attach a cord to the stick, looped for carrying.

"For a hood to protect the threads from the weather and your hand from the threads, start with a bottle cap and cut a leather plug to cover it generously. Stitch this to a leather skirt about two inches long, tapered at the bottom to stay on.

"Leveled or tilted (as for flower close-ups) this standee will do your job. With a thread from the shutter release carried around the staff, it will even catch shy animals for you from cover. Try it."

And that is the Smethport Standee. Other readers having gadget ideas to share are hereby invited to do so.

SLIDEFILMS

From time to time during the past several years, I have included in "Camera Trails" information on sources and techniques of visual education. I have done this (and hope to continue to do so) because I feel that pictures, slides and movies can be of considerable value in present day education. Now do not get me wrong. I do not believe schools should go overboard about pictures, recordings, and other visual or oral teaching devices. I still maintain that a good live teacher is worth his weight in phonograph records or movie films.

Some subjects do not lend themselves well to visual presentation. Can you, for example, imagine a room full of kids sitting on the edges of their chairs and chewing their fingernails while watching a hero on the screen diagram an English sentence? On the other hand there are school subjects that lend themselves exceptionally well to visual presentation.

Finding the proper films is a problem for many teachers. Such things are available, they know, but where, for how long, and at what price? For the past nine years The Educators Progress Service, Randolph, Wisconsin, has been publishing an annual *Educators' Guide to Free Films*, both movie and "still". Recently, the same organization has published a guide to slidefilms alone. Title of the new book (paperbound, 114 pages) is *Educators' Guide to Free Slidefilms* and the same two editors, Mary Foley Horkheimer and John W. Diffor, have collaborated. Price $3.00.

The guide lists 385 titles of slidefilms, 266 of which are silent and 119 of which are sound. Additional information with each title tells the number of frames, the running time, whether or not the film is in color, and indicates whether there is text within the film or whether an explanatory script accompanies it.

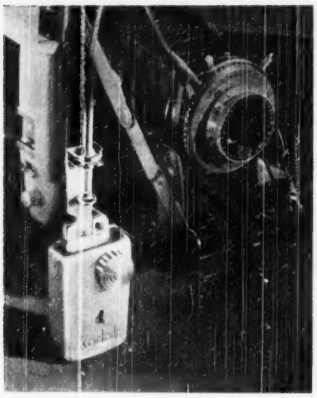
Many of the titles look interesting, particularly those in the field of social studies. There are, however, a surprising number of titles in German, about which the guide laconically states: "No material available for annotation. The text is in German." None the less, I think the new guide to slidefilms is well worth adding to a school's visual aids library.

GADGETS TO BUY

"Infinity" is a hard word to define, but I think the seemingly endless number of camera gadgets on the market closely approaches infinity — or will, in the years to come. Some are useful while others just take up storage space.

For the photographer who needs a dependable flash extension unit, Kalart has a new one called the Kalite. Special safety-first features are designed to prevent misfires and to permit instant checks for continuity of circuit. The unit is intended to provide for side lighting, extension flash and multiple flash photography. It sells for $10.95, complete.

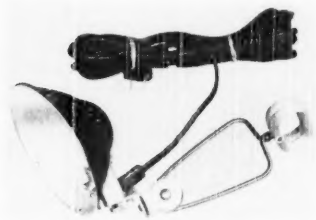
Eastman has a new little gadget that



This device, the Kodak Auto Release, delays shutter action so that picture takers whose cameras do not have built-in self-timers can get into the picture themselves.

will enable picture takers whose cameras do not have built-in self-timers to get into the pictures themselves. The device, called the Kodak Auto Release, operates with a cable release and trips the shutter automatically after a predetermined period of time — the time limit being approximately ten seconds. The release is priced at $4.25, federal tax included.

Also, in line with my discussion last month on the care and storage of films, Eastman has a new booklet on the subject: "Storage and Care of Kodak Color Films." It deals not only with how to care for exposed and processed films, but also with



The Kalite, new Kalart flash extension unit, is arranged to prevent misfires and to provide extra light for flash pictures.

the unexposed films both before and after the original package is opened. The booklet may be obtained free from the Sales Service Division, Eastman Kodak Company, Rochester 4, N. Y.

The Gevaert Company of America, Inc., 425 West 55th Street, New York City, has announced a new method of making monochrome prints from color negatives. These prints are reported to lend themselves especially well to sepia toning. The process is made possible by means of a new type of paper, which may be used for contact printing or enlarging. Gevaert plans to supply kits of paper and chemicals for amateur use, with replacement units available in all popular sizes. Prices were to be announced shortly after the first of the year and additional information can be obtained from the company.

Buffalo Nature Salon

The Twelfth International Salon of Nature Photography will hang in the Buffalo Museum of Science from May 16 through June 13. There will be five classes of photographs, in each of which at least three awards will be made. The latest day on which entries can be received is May 13. Full details may be obtained from *Hobbies*, Buffalo Museum of Science, Humboldt Park, Buffalo 11, New York.

Nesbit Kodaslides

From Paul W. Nesbit, Moraine Park Road, Estes Park, Colorado, comes a new and enlarged listing of his educational, two-inch Kodaslides of the West. His collections cover birds and mammals; National Park scenes; flowers, shrubs, trees and other plants; geological and meteorological phenomena. Mr. Nesbit will be happy to send full details to any interested in this material, which is available both for sale or rental. Another source of Kodachrome slides is Carl B. Obrecht, 726 Gladstone, Detroit 2, Michigan. Listings we have received include botany, North American mushrooms and geology. Mr. Obrecht will be glad to send details.

Conservation Caravan

Word comes from Mabel James, Buffalo Museum of Science, Buffalo 11, New York, that a Conservation Caravan, patterned after the successful ten-day trip of last year, will spend six days, from April 10 to 15, traveling the "Niagara Country." This is sponsored by the Museum and the Conservation Forum of New York State. Miss James and Ellsworth Jaeger, Curator of Education at the Museum, will be co-directors. Full information may be obtained from Miss James.

Yosemite Field School

The Yosemite Field School offers men and women intensive, varied training in the presentation of natural and human history to the general public. It gives practice in the techniques of interpretation — on Nature walks, with groups of children, before campfire audiences, and in museum lectures. Started in 1925 as the Yosemite School of Field Natural History, interrupted by World War II, the school reopened in 1948 with a new name and new emphasis. Since its inauguration more than one hundred graduates have been employed by the National Park Service, and many others are in park and museum work. As conducted today the course provides splendid administrative training and leadership experience. The enrollment is limited to twenty, and all must be college graduates or equivalent. Full details may be obtained from the Yosemite Field School, Yosemite National Park, California.

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THE "SPORT" OF KINGS

(Continued from page 136)

on their first migration.

In 1945—when gas rationing was a factor—Dr. Spofford wrote that "so far falconers have not kept, on the average, more than a dozen of these birds per year." Now, in an average year, about fifty peregrines are taken at Assateague. A fiction maintained in the popular articles on falconry is that many if not most, of the peregrines trapped at Assateague are caught for banding and are subsequently released. A notable fact overlooked by the writers of these glowing tributes is that few such banding records exist at Washington. Unfortunately many falconers have banding permits — obviously a convenience when in need of small birds for hawk food — and some few band hawks.

"Obviously," Dr. Spofford stated, "no adult or 'haggard' falcons should ever be taken, as there is too much probability that any such is a breeder." Yet adults are preferred by many falconers and are regularly taken, although more difficult to trap. In an article on hawk training, Mr. G. G. Goodwin specifically recommends that "haggards [adults] be carried for 24 hours the first few days."

"And the day that an adult peregrine is trapped at the nest will be a sad one for American falconry," Dr. Spofford wrote with dramatic impact in 1945. Yet adult birds are trapped at the nests. Roger Tory Peterson, in his book, *Birds Over America*, noncommittally relates an anecdote of two prominent falconers, Alva G. Nye and James B. Fox, trapping an adult male at the eyrie in the belief that a replacement would take place. Despite the fact that they later released the old male, the implications of such a story are disturbing.

Several States protect the peregrine, and where (partial) protection has been enforced by policing of the eyries in the breeding season, as in Massachusetts, the population has returned to a normal level. In Massachusetts, when the bird was given statutory protection in 1934, falconers and egg collectors were responsible for breaking up two-thirds of each year's nesting, according to Conservation Department estimates.

Even in States that protect the bird, falconers have devised many dodges to get possession of a peregrine. One of the most curious of these was the adoption of the nomenclature "Sand" or "Arctic" falcons for the Assateague peregrines. These birds, of course, are the same species as our eastern birds, although most of the Assateague birds are lighter about the head than our Appalachian birds, and it has been assumed that they are from northern populations.

The New York State Conservation Department was actually misled by this spurious nomenclature into issuing two permits for Sand or Arctic falcons. These permits were issued in 1948 to two young men specifically recommended by a prominent falconer, although they had previously been convicted of an attempted eyrie robbery in the Palisades.

The indifference of conservationists toward falconry is based on the false assumption that few birds are affected. It is not generally understood that while the popularity of egg collecting — once an equally potent threat — has diminished, the popularity of falconry has increased. Nor is it generally realized that photos and methods of trapping have been publicized. Our American penchant for doing everything on a large scale already threatens the peregrine. In an article in *True Magazine*, lauding "the supersportsmen" of falconry, it was reported that Alva G. Nye and William Turner took twenty-eight hawks (peregrines) by hand in one week-end. Ironically the author added: "The last professional falconer and hawk trapper of Europe would have been satisfied to take that many in a month or more on the moors of Valkenswaard, Holland. . . .The Americans turned the hawks loose."

Although suggestions have occasionally been made by such rare falconers as Dr. Spofford that a falconry organization be established whose rules are consonant with sound conservation practices, no such organization has been effected. Most such proposals have been tied up, as was Dr. Spofford's, with the suggestion that falconers be permitted to take game. State game departments should realize that these proposals constitute a threat to protected game species, as hunting with hawks is by its very nature undiscriminating. A falcon flying loose cannot be controlled. She will stoop at any species. In fact, she will usually prefer an easily handled meadow lark or flicker to a struggle with a crow, which might be legal "game." In issuing permits to falconers conservation departments would be actually condoning violations of the conservation laws.

The only permanent solution to the threat of falconry is the proposal put forward by Dr. Spofford, to protect the peregrine under Federal statute. Let us protect this rare bird before the threat to its numbers becomes a reality; before we are obliged to put on the fanfare of a Save-the-Bird-from-Extinction fight with such spectacular press releases as; "Planes are searching the tundra for Arctic eyries. . . . Relays of brilliant ornithologists are beating the virgin swamps for those swamp nesting peregrines . . . ." Let us keep the peregrine where we can all admire it; in the wild majesty of its chosen cliffs, instead of some suburban attic.

GROW TREES

(Continued from page 126)

the back border, or in the woodlot rather than in a small garden."

The eight-acre tract devoted to the Montgomery Collection in the New York Botanical Garden is ideally located for such a purpose. The long, bowl-like strip, with a walk in the center, is near the entrance to the Zoo on Fordham Road. Although the center part is fairly level, the sides slope up sharply and are fringed with trees. The evergreens in the collection are placed as naturally as possible with all due regard to the principles of good landscaping. The landscape work was done by Miss Marian Cruger Coffin of New Haven, and Henry F. DuPont, noted horticulturist of Wilmington, Delaware. The weeping and dwarf trees are so placed in relation to one another, and the taller trees, that related or similar species and forms make interesting groups. It speaks well of the excellent job of moving and subsequent care that not a single tree was lost. Every one looked surprisingly well, considering the seriousness of the drought, at the time I saw them. This was largely due to the expertness of the movers, and since the collection was transplanted every tree has received an ample supply of water whenever the ground became dry.

Watering, according to both Colonel Montgomery and Director Teuscher, is of the utmost importance. The roots of most evergreen trees go deep and they have the ability to convert the crude minerals in a soil to plant food. This is aided by root fungi — micorrhiza — which can become parasitic if the soil balance is disturbed. Mulching with organic matter is therefore advisable, instead of the use of artificial fertilizers. If the ground is dry, this natural balance may be upset, and it is especially important that evergreens be watered before the ground freezes in case the weather has been dry.

Included in the Montgomery Collection in the New York Botanical Garden are such familiar species as the white fir, *Abies concolor*, and the limber pine, *Pinus flexilis*, of the western states. The majority, however, are horticultural forms, many of them unique. There is, for instance, a Japanese yew, *Taxus cuspidate aurescens*, of a startingly brilliant yellow. And our old standby the Norway spruce is represented with horticultural forms ranging from a pendulous tree with gangling branches to cushion types no higher than a footstool. The umbrella pine of Japan, the Swiss stone pine, and the weeping form of the Serbian spruce are just a few of the hundreds of notable and interesting specimens assembled by Colonel Montgomery.

Amateur Naturalist

The Explorer Naturalist is the name of an interesting little, 30-page, multigraphed publication of the Amateur Naturalists Association. Its aim is the rediscovery of America with notebook and pencil, and the bringing together of the amateur and the scientist. The editor is Robert R. Harry, whose address is P.O. Box 62, Los Altos, California. The raccoon has been adopted as the official animal of the Association.

MARS NEARER THE EARTH

(Continued from page 157)

earth. The central line of the path passes close to the earth's surface, but misses it by about 16 miles. The area within which this path touches the earth lies in the South Atlantic between the 50th and 70th parallels of south latitude, and from approximately 20 to 40 degrees east longitude. About 93 percent of the sun's diameter will be covered by the moon within the region where the annular eclipse will be visible. Partial eclipses of the sun will be visible within all of the region covered by this eclipse, the greatest magnitude never exceeding that of the annular phase and decreasing to zero at the limit of the region.

The planet Saturn will be in opposition to the sun on March 7, when it will be visible all night. It is still in the constellation of Leo, about 20 degrees to the southeast of Regulus, and appears yellowish in color and brighter than Regulus. The Rings of Saturn are not widely open at this time, and will disappear temporarily about the middle of September, when the earth will be for a brief period in the same plane as the Rings as it passes from the south to north side of them. This temporary disappearance of the Rings, which lasts for only a few hours, if the planet is viewed in a powerful telescope, occurs twice during Saturn's period of revolution around the sun at intervals of about 15 years. Seven or eight years before and after the years when the disappearances occur, the Rings are inclined to the plane of the earth's orbit at the greatest angle and appear most widely open. The light then received from the Rings is so great that the brilliancy of the planet is fully twice what it is in a year, such as the present, when temporary disappearances of the Rings occur.

Venus, which was at its greatest brilliancy in the evening sky on December 25 of last year, will again be at greatest brilliancy on March 6, but this time the planet will be in the morning instead of the evening sky, a magnificent object in the southeast before sunrise.

Jupiter is also in the morning sky at this time, but low in the southeast at sunrise early in the month. Mercury and Jupiter will be in conjunction on March 1, but the two planets will be so close to the horizon at the time that it is doubtful if one can pick them up in the morning twilight. They will be an interesting pair to observe if one can find them. Mercury will pass Jupiter about one degree to the south of it. On March 28 Mercury will be in superior conjunction with the sun, and will be too close to the sun to be seen most of the month.

Spring in the northern hemisphere will begin this month on March 20 at 11:36 P.M., Eastern Standard Time. The sun will then be on the celestial equator and the day and night will be equal in length all over the world. Autumn will begin in the southern hemisphere.

Woods and Fields

In Woods and Fields. By Margaret Waring Buck. New York. 1950. Abingdon-Cokesbury Press. 96 pages. Illustrated by the author. Cloth $3.00; Paper, $1.75.

This is a most attractive book intended to be an introduction of boys and girls and beginning naturalists to many of the fascinating details of the woods and fields. It is the result of long personal observation and study backed by advice from a number of leaders in the field of Nature education for young people. The book treats with the subjects to be seen on a seasonal basis, with due allowance for geographical variations, and further subdivides the subjects by the locale in which they may be found. The author's illustrations are as delightful as her text. There is an excellent index and a well-selected bibliography.

Garden Tours

The Volunteer Associates of the New York Botanical Garden announce two spring garden tours, one to the garden of Pierre du Pont at "Longwood," near Wilmington, Delaware, and the garden of Mr. and Mrs. Henry F. du Pont at Winterthur, Delaware. The other tour is to the gardens of Mrs. Oakleigh L. Thorne and Mr. and Mrs. Walter Beck at Millbrook, New York. Applications and details are available from New York Botanical Garden, 801 Madison Avenue, New York 21, New York.

"Plant America"

"Plant America — For More Natural Living" is the slogan of a movement launched by the American Association of Nurserymen at a dinner held in New York on January 5. Governor Duff of Pennsylvania sounded the keynote of the program, which would encompass plantings in forest, on farms, in cities and towns, along roadsides, around churches and schools, on the grounds of factories and, of course, around homes. The planting program has conservation significance as it affects soil conservation, flood control, wise use of forest land, preservation of wildlife habitat, and beautification generally. Full details of the movement may be obtained from the American Association of Nurserymen, 295 Madison Avenue, New York 17, New York.

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American Nature Study Society

ANNUAL MEETING

"LET'S have *more* nature books, *not fewer*, and let's have them *better!*" was the slogan offered by publisher Raymond T. Bond of Dodd, Mead as the climax to a series of stimulating, practical talks on Nature writing and Nature books.

The talks by Mr. Bond, Roger Tory Peterson, Ellsworth Jaeger, and Howard Zahniser were a feature of the annual Christmas Meeting of the American Nature Study Society in New York. They set off one of the liveliest discussions in the history of the Society.

As a direct result, a Nature Book committee consisting of Eva Gordon, chairman, E. Laurence Palmer, Farida Wiley, and Margaret Morse Nice was established. The group of Nature experts will review both Nature books and manuscripts, and strive to encourage writers and publishers to produce accurate, interesting, and well-written books.

One of the chief projects of the committee will be the annual selection of twelve outstanding Nature books.

Overflow crowds attended this session, and the next day's program on Nature Photography. On this panel were Allan D. Cruickshank, Edwin Way Teale, Rutherford Platt, and S. Glidden Baldwin. Each speaker encouraged would-be photographers to enter the Nature field, and gave concrete suggestions for getting pictures that are "different." Salon prints, Kodachrome slides and movies illustrated the series of talks.

As successful as the 1947 Christmas trip to the Indiana Dunes was the 1949 foray to Jones Beach on the south shore of Long Island. Led by Edwin Way Teale, Roger Tory Peterson, E. Laurence Palmer, Richard H. Pough, and Richard L. Weaver, 90 persons turned out on a cold, clear morning in hope of seeing snowy owls.

They were not disappointed, since at least four of the big white owls were sighted. One fearless snowy held his ground until the advancing crowd was scarcely 100 feet away, then took wing and flew majestically over the naturalists.

Seen, also, were the abundant field mice and rabbits, serving as food during this quadrennial invasion by the owls. One owl pellet discovered on the trip revealed a diet of oil-killed dovekie. Other "little auks," found dead on the beach, were clearly victims of oil left on the ocean by passing ships.

At the annual business meeting at the New Yorker Hotel, the reelection of President Richard W. Westwood, Editor of *Nature Magazine*, was announced. Vice-president for 1950 will be Eva Gordon, while Richard L. Weaver will serve the second year of a two-year term as Secretary-Treasurer. New directors, elected for two-year terms, are Marie Gaudette, Roger Tory Peterson, Dorothy Treat, William Vinal, and Arthur R. Whittemore.

The Society chose Hazel Fink of Elmsford, New York, to edit its quarterly *News-Letter*. An editorial committee for the *News Letter* and the Society's page in *Nature Magazine* was named: Charles E. Mohr, chairman, Raymond Gregg, and Richard H. Pough.

The American Nature Study Society cooperated with the National Association of Biology Teachers and the National Science Teachers Association in arranging two joint sessions dealing with recent developments and trends in science, and in sponsoring a joint annual banquet, on December 29. The meetings were held in conjunction with the 116th Meeting of the American Association for the Advancement of Science. Next year's meeting will be held in Cleveland, Ohio, during the Christmas holidays.

Summer Course

Advanced Nature Study, a practical course in outdoor education, will be given by the State Teachers College, Indiana, Pennsylvania, June 5 to 16. It will be an intensive three-credit, three-week course at Camp Seph Mack on Yellow Creek, nine miles east of Indiana. Dr. Donald E. Hoffmaster will be in charge of the course, aided by others on the college staff. The training will give teachers experience in outdoor education procedures that will aid them in public school camping programs or other summer camp work. Full details may be obtained from the College.

Service to Scientists

Announcement is made of the organization of the Science Book and Information Service, 471 Orange Street, S.E., Washington 20, D.C. It is designed to aid scientists and technicians to reach source material in specialized fields. Full details may be obtained from the address above.

Wildlife Week

From March 19 to 25 attention will be focused on our wildlife problems through the observance of National Wildlife Restoration Week, proclaimed by the President and carried on under the sponsorship of the National Wildlife Federation. State, county and local group meetings will be held throughout the country, with conservation as the central theme.

Marking Pen

Information comes to hand about "The Dri-Flo Marker," a new marking pen that makes an indelible marking on any type of porous surface. It is designed to fill the need of those who wish to mark permanently a variety of equipment, especially that used in the outdoors and subject to considerable wear and weather. Details from the Dri-Flo Manufacturing Co., 643 East 10-Mile Road, Hazel Park, Michigan.

The Universe

Measuring Our Universe. By Oliver Justin Lee. New York. 1950. The Ronald Press Company. 170 pages. Illustrated. $3.00.

"This book," says Dr. Lee, in his preface, "has been written for those persons whose questing minds have wondered how scientists measure the distances, almost infinitely small and infinitely great, with which they deal. It is an attempt, shall I say, to explain how they know what they know about distances, the tremendous importance of accurate measurement to the work they do, and the rigorous logic used in handling and interpreting accurate measurements." Professor Lee entitles his first chapter "The Romance of Distances," and he succeeds signally in thus introducing the reader to his subsequent consideration of distances in the universe. This is another volume in Ronald's "Humanizing Science Series," and is a fascinating presentation of information basic to understanding the universe, from the infinitesimal size of the inner atom to the vast distances of outer space.

National Park Poems

The Call of the West. By Evelyn Lewis Lee. Boston. Bruce Humphries, Inc. 59 pages. Illustrated. $2.00.

This attractive little book is primarily devoted to the National Parks of the West, and reflects the author's love of these great reservations. She has chosen to pay tribute to these areas in picture and accompanying poetry. Of El Capitan in Yosemite National Park, for example, she writes:

> "Dome of majesty transcendant
> Citadel of Force divine,
> In nobility resplendent
> Sovereignty alone is thine."

In Bryce Canyon she sees in the ranks of fascinating formations a choir "in pageantry magnificent," and finds the Rocky Mountain goat in Glacier National Park "a king, content, aloof from earth's unrest." Miss Lee's poems are competent and reflect a true love for the areas of the West about which she writes. Her little book is a charming gift for other lovers of the western scene.

Iowa Conservation

"Conservation Journeys for Iowa Boys and Girls" is the title of Bulletin No. 10 of Iowa State Teachers College, Cedar Falls, Iowa. It is the work of Alison E. Aitchison, Professor of Geography, and he has adopted a geographical technique in handling the text, taking the young readers on an hypothetical conservation journey about Iowa, and about the United States, with some flying trips to other lands. It makes a lively and interesting approach, and seems a fine example of integrating geography with conservation, just as other courses may also be integrated.

THE READER'S MARKET

A place where members of the American Nature Association and readers of Nature Magazine may find many interesting offerings or may advertise themselves, at low cost, for things wanted; things they have for Sale, for Trade, for Sale or Trade. This is an excellent forum for acquiring or disposing of such items as binoculars, books, cameras and photographic equipment, magazines, sports and outdoor equipment, etc.

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Under the Microscope

By JULIAN D. CORRINGTON

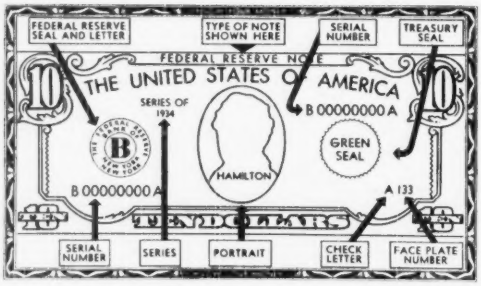

Diagram of a $10 Federal Reserve Note, identifying various features of paper money.

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COUNTERCHECKING THE COUNTERFEITER

According to published figures, the average annual loss from counterfeit money in the United States from 1933 to 1936, was $771,000, whereas in 1942 it was only $48,000, a drop of 93 percent. One of the main reasons for this reduction to a negligible quantity was the educational campaign put on by the Secret Service of the Treasury Department. Beginning in 1937, the double-barreled objective of their nation-wide crime-prevention program has been to train the public, as their slogan states, to "know your money," and be able to recognize fake greenbacks, as well as to learn how forgers obtain and cash government checks.

The average person looks at his paper money only to the extent of noting the denominations, and seldom consciously sees all of the fine detail of the engravings. The crudity of some of the counterfeit bills that have circulated in your city and in mine is ample proof of the ignorance and carelessness of millions of our citizens.

The Secret Service concentrated on the schools, hammering also at banks and police departments, and the drive still continues; there can be no respite in the never-ceasing war on criminals. Inasmuch as even the possession of a piece of the queer subjects one to a possible fine up to $5000 and imprisonment to 15 years, it is strictly up to each honest hombre to learn the simple rules for detecting bad money.

In our first article on this subject, (January) methods of reproducing illustrations were described, such as line engraving, intaglio, and lithography, together

Composite enlargement of the Treasury seal from genuine and counterfeit bills.

with the protection given genuine currency by the nature of the paper used, with its fine red and blue silk fibers, duplication of which is prohibited by law.

Considering first the general world picture, in the see-saw warfare between the counterfeiter and the maker of legal mazuma, the first big gain was scored by government forces through the use of *engine turning* or *geometrical lathework*. This is a form of decoration made with a rose engine or cycloidal engine or geometrical lathe, as variously termed, invented by Asa Spencer about 1818. This wonderful machine, with its numberless eccentric movements, will reproduce continuous patterns in any conceivable design. Watch cases and paper money afford outstanding examples. Observe the fish-net or lacework scrolls along the border and around the large corner numerals of a dollar bill. With a hand lens note that none of these fine lines is broken or joins another; each is endless and absolutely regular, with no defect in uniformity of curve, width, degree of shading nor has any other imperfection. These lathes cost a small fortune, and obviously a man with that kind of dough is scarcely to be enumerated among counterfeiters! As to imitating this work by hand, perfection is impossible, lines will be smudged, broken, and run together, as shown in some of our illustrations. Usually the spurious copies can be detected with the naked eye.

Again, examine the fine parallel-ruled lines in various places on a one-dollar silver certificate, as the background of Washington's portrait, the shading of the large numeral "1" to the left of this portrait, or the "one" making up most of the center of the reverse side, or the background of the obverse of the great seal of the United States; these are made with a parallel-ruling machine and are mathematically exact. With a lens, these lines are readily counted. Counterfeit rulings are not countable and are broken, blurred, irregular.

The intricacy of designs made possible by the rose engine drove most counterfeiters out of the business for a while, but the advent of photography placed a most powerful weapon in their hands, and they bounded back to checkmate the law. Intricacy meant nothing when one was doing his copying with a camera. The next tally for the law came in 1856, when Henry Bradbury developed anti-photographic banknote printing, in which two colors were so superposed that, when photographed, a confused jumble resulted. For example, red photographs black, and

Enlargement of Washington portraits from genuine and counterfeit $1 bills.

Materials in a counterfeiting plant seized by the U.S. Secret Service at Bremerton, Washington.

so if a design depended for its interpretation on separate red and black portions, a photograph of this composition would appear all black and would lose distinctness.

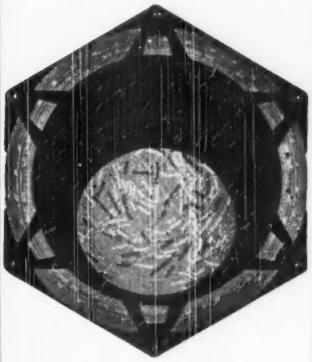
Increased knowledge of color photography next chalked up one for the crooks, when means were found to photograph either superposed color separately. Introduction of a third color only complicated the issue but did not prevent copying. Today, in various countries, there are generally counterfeit bills of one denomination or another cropping up now and again, but copies that will pass even casual inspection are very difficult to make because of a variety of measures. We have already described paper composition and geometric lathework. Another such stumbling block to copying used by some governments but not in our own country, is *watermarking*. This is done by having a projecting design on the dandy roll, a roller that presses the paper for this purpose. The result is a paper that is thinner in the places corresponding to the raised portions on the roller, and hence the design may be seen as a translucence when the paper is held to the light. Inspect a sheet of bond typewriter paper in order to see a specimen of watermarking.

Composite numeral and counter from genuine and counterfeit $1 bills.

The pattern may be applied at each turn of the roller onto a continuous felt which is later dried and cut into sheets. The watermark may then show at any position, often with portions half off the edge. In finer work, the watermark may be *registered* with the printing, i.e., aligned in a definite place so as to form a characteristic part of the overall design. A portrait, for example, may be made by watermarking, then registered in a conspicuous window of a banknote, making a bill exceedingly difficult to counterfeit.

Vignetting offers still another means of introducing complexities into the design of paper money, and hence makes the counterfeiter's work all the more difficult. Originally *vignettes* were pictures of buildings, scenes, portraits, historical occasions, or allegorical figures that faded out gradually at the edges into the surrounding white paper, such as the illustration of the U. S. Treasury building on the back of the Federal Reserve sawbuck. Similar illustrations with definite outlines are today included under the term "vignette" by the money-makers, according to information sent us by Treasury officials, a practice not in agreement with usage in other fields. These pictures are hand engraved, and so can be imitated by a first-class artist, but the finest engravers are those employed by governments

Know Your Stars



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and not those who are attracted by the *ignis fatuus* of a hounded underworld career. Usually there are not more than a dozen men at any one time in the United States, for example, who have the skill to imitate the beautiful, finished, and expert engraving seen on banknote plates, and these men are known. The nation is divided into fifteen Secret Service Districts for the suppression of counterfeiting and related tasks.

Considering the world picture again, all three methods of transferring designs in printing paper money have been used — letterpress, intaglio, and lithograph. In letterpress the design is raised, as in a wood engraving or in the letters of ordinary type. Lines and dots are sharp, but lack the rich effect of relief. Postage stamps are commonly printed by this method.

Intaglio engraving on steel plates is a favorite procedure for paper currency. The engraver employs lines and dots, spaced closely or farther apart, to produce the dark or the light masses that make up vignettes. Bold lines may fade to fine ones, a good specimen being seen in the hair of Washington on the dollar bill. This is called "black line work." At other times the artist will use "white line work," where the spaces between the lines carry the ink, the lines being clear and showing the white of the paper — an exceedingly difficult form of engraving to counterfeit.

Rotogravure portraits have been used, also offset lithography, and either may be supplemented by letterpress printing of words or numbers. Bank of England notes are letterpress, security depending mainly on the paper. The United States relies, for security, on both the paper and engraving. The design of notes is changed frequently and old ones are withdrawn from circulation. Fine intaglio engravings on steel plates, printed on a high grade and distinctive paper, with lathework and colored inks, furnish a formidable barrier to illegal competition.

At the Bureau of Engraving and Printing in Washington, each engraver is a master of some one phase of the work. One man does only portraits, another scenes, and still another numerals. It would take a counterfeiter extraordinary to cope with this array of talent.

The United States issues three kinds of banknotes: silver certificates (blue seal and numbers), United States notes (red), and Federal Reserve notes (green). The circular colored design in the right half of the face of these bills is the *Treasury seal* — "Thesaur. Amer. Septent. Sigil." — Seal of the Treasury of North America. The perfect saw-teeth around the rim of the seal can only be approximated in an imitation. Within the wording is an ermine shield divided into upper and lower portions by a chevron — in this case in the form of a carpenter's square, with a scales above and a key below. The *serial number*, printed above the seal, and repeated below the central design of the left half of the face of the bill, is in the same color as the Treasury seal, and printed from special and unique numbering blocks. Always in black is the small *check letter*, seen at the right of the large upper left-corner numeral; it appears again near the lower right corner in conjunction with the *face plate number*, which identifies the steel plate from which the bill was printed. There will be also a *series* designation, such as "Series 1935 C," and the facsimile *signatures* of the Treasurer of the United States and of the Secretary of the Treasury. The Federal Reserve seal and letter appear, on notes issued by such banks, at the left center, balancing the Treasury seal at the right. Altogether, paper money can easily qualify as the most complex of all engraved subjects.

The portraits that always adorn a particular denomination of United States banknotes are: $1, Washington; $2, Jefferson; $5, Lincoln; $10, Hamilton; $20, Jackson; $50, Grant; $100, Franklin; and (though such information will be purely academic for most of us) $500, McKinley; $1,000, Cleveland; $5,000, Madison; and $10,000, Chase. One form of monetary forgery is the attempt to raise a bill, such as making a $2 bill appear to be a $20 bill by altering the numerals; here a knowledge of the congruent portrait would immediately spot the imposition.

To Dick Tracy's familiar admonition of "Crime never pays!" we will now have to add the slogan of the Secret Service, "Know your money!"

RETAIL, REPAIR, REBUILD

A NEW firm has appeared in the scientific instrument field, the Heinicke Instrument Corporation, 315 Alexander St., Rochester 4, N. Y. Dr. Kurt J. Heinicke is president. This company handles new scientific equipment, such as standard makes of microscopes and microtomes, but specializes in rebuilt items and in repairs.

Some examples of their quotations are: B & L, Spencer, or Leitz, top fine adjustment monocular microscope, with 16 mm, 4mm, and oil immersion objectives, 5X and 10X eyepieces, Abbe condenser, $128; same, but side fine adjustment, $140, both microscopes completely reconditioned and guaranteed to perform like new instruments. Repair of fine adjustment, $4. Complete cleaning, lubricating, relacquering, rebuffing, of biological microscopes, $8.50. A card to them will bring you their circulars.

Corrington on Video

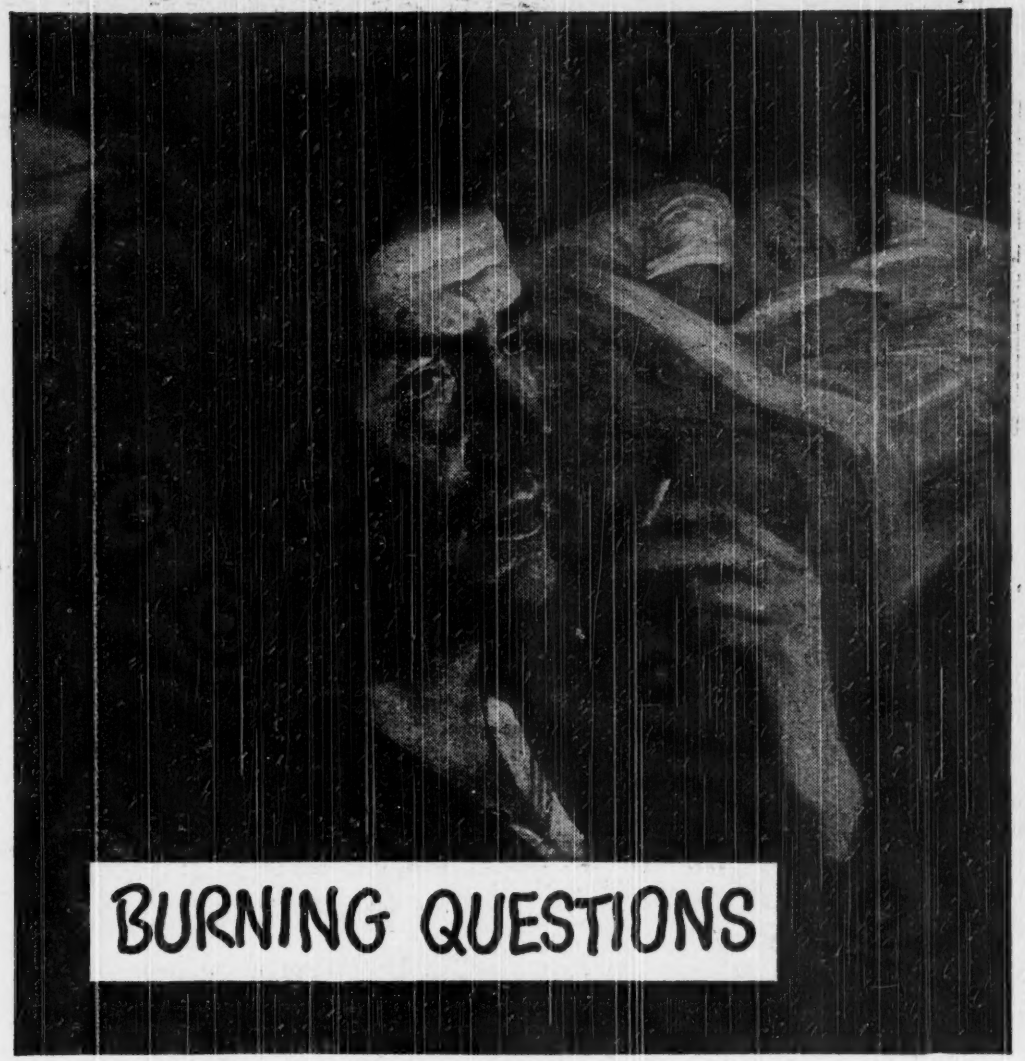
POPULAR education in south Florida natural history and conservation is being regularly spread through greater Miami's 10,000 television sets every other Tuesday at nine p.m. The program is known as "Science Show Window," and is a production of the University of Miami Radio and Television Department and Station WTVJ, Florida's first and Miami's one video station.

Recognizing that many residents of the area know the flora and fauna of other regions from which they have migrated to Miami, emphasis is on the natural history of south Florida. Although a casual and informal production when seen on the home television screen, the show is the result of careful preparation and staging. As many live specimens as possible are used. A mammal program introduced a live panther, otter, raccoon, opossum and a spotted skunk. The staff of the University is drawn upon for talent.

Collaboration between the University and the television station, of which Col. Mitchell Wolfson is president, includes unusual instructional advantages for students from many parts of the country. It has also given the University an excellent opportunity to explore the possibilities of the new educational medium offered by television.

PHOTOGRAPH BY FRED B. FLEMING

Dr. Julian Corrington explains the characteristic of a red-bellied mud snake to Oliver Griswold, interviewer, while Sydney W. Head, Chairman of the Radio and Television Department, holds a script of questions on the University of Miami television show.



BURNING QUESTIONS

Late at night, some men do their hardest worrying. Each thought glimmers and glows like the burning end of a cigarette. Chain-thoughts like these:

"How am I doing my job? Have I already reached my top? Are my best earning years numbered?

"And how will that affect my other job—as husband, father, family provider? Will I be able to do the things we've planned? What about college for the children? And our home—will I always be able to meet payments?"

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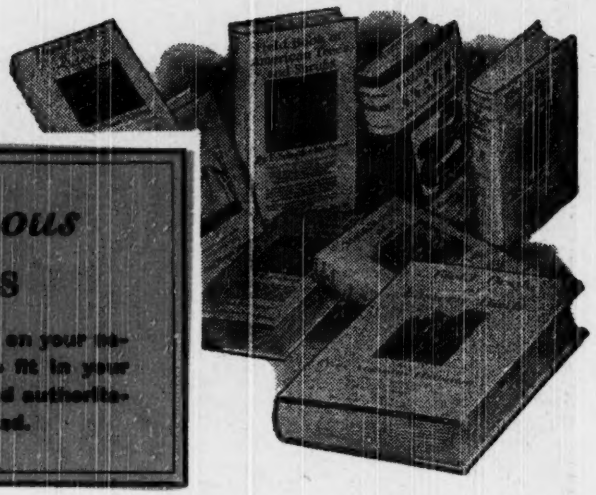

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